AD-A069 080 OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1 PHASE E, --ETC(U)
APR 79 J A THOMPSON
UNCLASSIFIED MANCP-416(79) NL

1 OF 2
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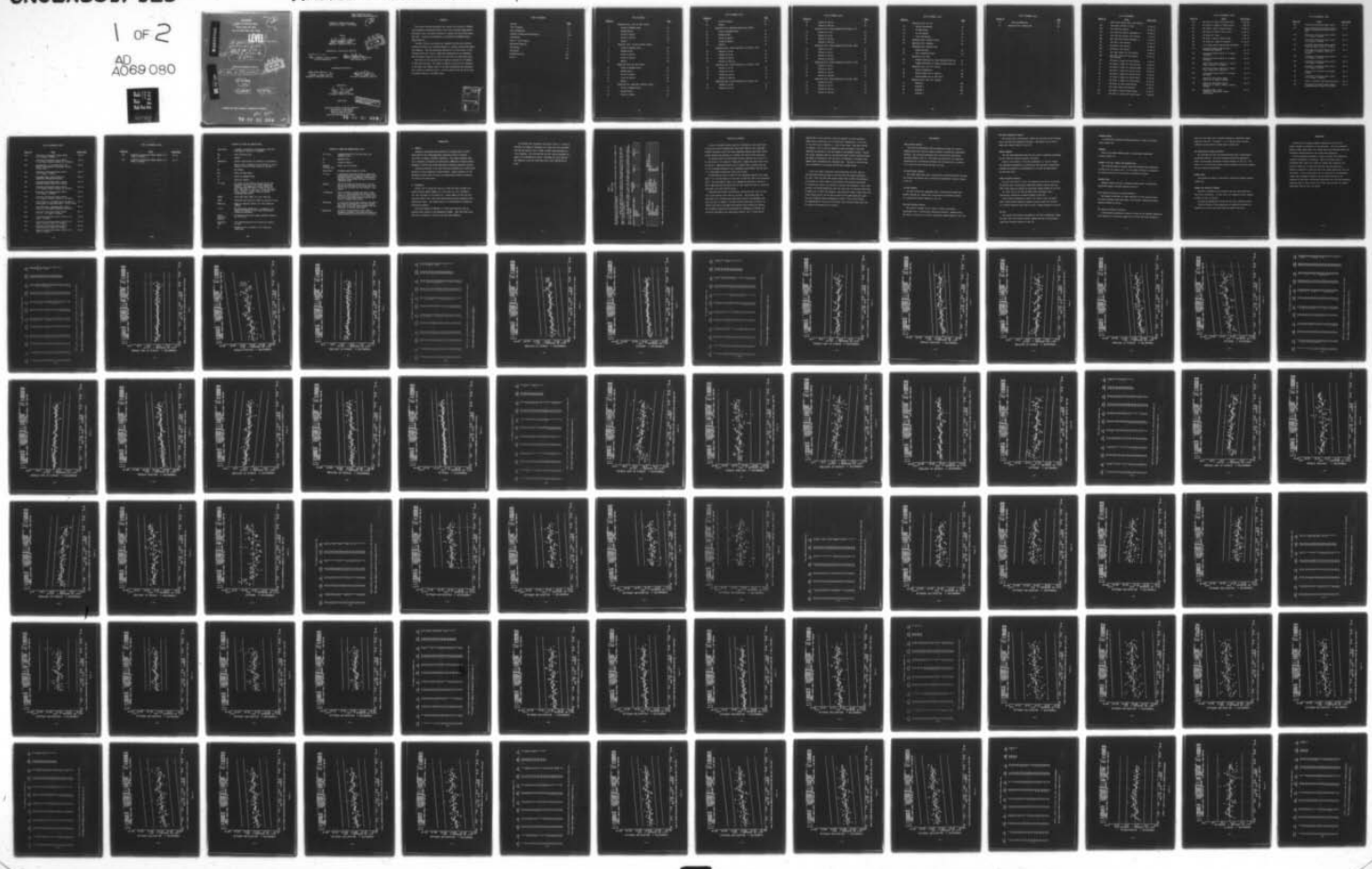

HEADQUARTERS
OGDEN AIR LOGISTICS CENTER
UNITED STATES AIR FORCE
HILL AIR FORCE BASE, UTAH 84056

PROPELLANT SURVEILLANCE REPORT LGM-30 F&G STAGE 1 PHASE E, SERIES VII and TP-H1011,

PROPELLANT LABORATORY SECTION

John A. Thompson

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416(79)

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MMWRM PROJECT M82934C-WNL17514

(2)

PROPELLANT SURVEILLANCE REPORT
LGM-30 F & G STAGE 1 (TP-H1011)

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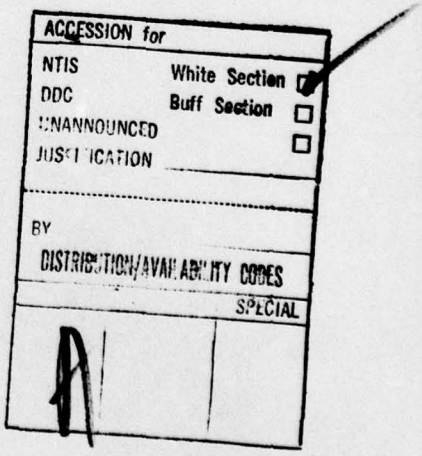
ABSTRACT

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M82934C-WNL17514.

The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (thirteen years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.



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LIST OF REFERENCES

Report Nr	Title	Report Date
	LGM-30 First Stage, Wing I Test Reports	
29A	Test Report (Missile in silo)	13 Jan 64
29B	Zero Time Test Results	29 Jan 64
29C	Zero Time Test Results (Supplement 1)	30 Mar 64
29D	Zero Time Test Results (Aft Closure)	9 Jun 64
29E	Zero Time (Aft Closure Supplement 1)	24 Jun 64
29F	ATP Phase I Test Results	30 Mar 65
29G	ATP Phase I Test Results	19 Aug 65
29H	ATP Phase I Test Results	10 Sep 65
32A	Zero Time, Wings II-V Test Results	17 Mar 65
32B	Zero Time, Wings II-V Test Results (Aft Closure)	18 Mar 65
32C	ATP Phase I, Wings II-V Test Results	3 Nov 65
49	ATP Phase I, Wings II-V (First Group)	18 Mar 66
53	ATP Phase I, Wings II-V (Second Group)	22 Apr 66
55	ATP Phase I, Wings II-V (Third Group)	29 Apr 66
58	ATP Phase I, Wings II-V (Fourth Group)	6 May 66
61	ATP Phase I, Wings II-V (Fifth Group)	10 Jun 66
66	ATP Phase I, Wings II-V (Sixth Group)	22 Jul 66
76	ATP Phase II, Wing I Test Results	24 Jan 67
78	Zero Time, Wing VI Test Results	3 Feb 67
104	ATP Phase I, Wing VI (First Group)	12 Oct 67
118	ATP Phase II, Wings II-V (First Group)	5 Mar 68

LIST OF REFERENCES (CONT)

Report Nr	Title	Report Date
126	ATP Phase II, Wings II-V (Second Group	11 Apr 68
130	ATP Phase II, Wings II-V (Third Group)	3 May 68
162	ATP Phase I, Wing VI (Second Group)	30 Sep 69
176	ATP Phase II, Wing VI (First Group)	15 Apr 70
181	ATP Phase III, Wing I	7 May 70
185	ATP Phase I, Wing VI (Third Group)	22 Jun 70
195	ATP Phase III, Wings II-V (Retest)	29 Oct 70
223	Surveillance Report LGM-30 Stage I(TP-H1011)	Sep 71
239	Surveillance Report LGM-30 Stage I (TP-H1011 and TP-H1043)	Apr 72
258	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 72
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271	Surveillance Report LGM-30 F & G Stage I Phase A Series II, (TP-H1011)	Jul 73
277	Surveillance Report LGM-30 F & G Stage I Phase A Series III, (TP-H1011)	Oct 73
280	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 73
288	Propellant Surveillance Report LGM-30 A & B, Stage I, TP-H1043	Mar 74
290	Propellant Surveillance Report LGM-30 F & G, Stage I, Phase B, Series I TP-H1011	Mar 74
300	Minuteman Stage I Motor Reliability Improvement Program Surveillance	May 74

LIST OF REFERENCES (CONT)

Report Nr	Title	Report Date
302	Propellant Surveillance Report LGM-30	Nov 74
313	Stage 1 Propellant Surveillance Report, Propellant Containing Glacial Acrylic Acid	Oct 74
315	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Jan 75
316	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Feb 75
319	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VI, TP-H1011	Apr 75
321	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase B, Series II, TP-H1011	Apr 75
325	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jun 75
328	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Sep 75
330	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Oct 75
335	Stage 1 Motor Reliability Improvement Program	Dec 75
337	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1043	Feb 76
339	Stage 1, New MAPO & ERL-510 Qualification	Mar 76
341	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VII, TP-H1011	Mar 76

Report Nr	Title	Report Date
343	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Jun 76
345	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase B, Series III, TP-H1011	Jun 76
350	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman, Stage 1, UF-2121 Liner	Sep 76
351	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Sep 76
354	Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Sep 76
358	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VIII, TP-H1011	Oct 76
360	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase E, Series III, TP-H1011	Nov 76
367	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Apr 77
370	Propellant Surveillance Report LGM-30 F & G, Stage 1, Phase E, Series II, TP-H1011	Apr 77
377	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman Stage 1, UF-2121 Liner	Oct 77
379	Final RIP Report, Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Oct 77
385	Propellant Surveillance Report LGM-30 A, B, F, & G, Stage 1, TP-H1043	Dec 77
388	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jan 78
390	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase E, Series IV, TP-H1011	Feb 78
392	Propellant Surveillance Report LGM-30 Dissected Motors, Phase IX, TP-H1011	Mar 78
393	Propellant Surveillance Report LGM-30 A & B Stage I, TP-H1011	May 78

Report Nr	Title	Report Date
396	Propellant Surveillance Report LGM-30 F & G Stage I, TP-H1011	Jun 78
405	Propellant Surveillance Report LGM-30 F & G Stage I, TP-H1011	Oct 78

GLOSSARY OF TERMS AND ABBREVIATIONS

Aging Trend	A change in properties or performance resulting from aging of material or component
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as stress divided by strain along the initial linear portion of the curve.
EB	End Bonded
EGL	Effective Gage Length
em	Strain at maximum stress
er	Strain at rupture
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points
JANNAF	Joint Army, Navy, NASA, Air Force Committee
MANCP	Propellant Lab Section at Ogden Air Logistics Center
Ogden ALC	Ogden Air Logistics Center, Air Force Logistics Command
r or R	The Correlation Coefficient is a measure of the degree of closeness of the linear relationship between two variables
Linear Regression Equation	The general form of the linear regression equation is $Y = a + bx$
Regression Line	Line representing mean test values with respect to time
S_b	Standard error of estimate of the regression coefficient

GLOSSARY OF TERMS AND ABBREVIATIONS (cont)

S_e or $S_{Y.X}$	Standard deviation of the data about the regression line
Sm	Maximum Stress
Sr	Stress at rupture
Standard Deviation (S_y)	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
"t" test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed
Significant	As used in the statistical sense, means a difference unlikely to have been the result of random sampling from some specified population.

INTRODUCTION

A. PURPOSE:

Laboratory testing has been performed for thirteen years on First Stage LGM-30 F and G Minuteman Motor propellant blocks to evaluate the effects of aging on TP-H1011 propellant. This report contains those tests conducted on propellant as instructed in MMWRM Test Directive GTD-1C, Amendment 2, LGM-30 First Stage Operational Propellant Laboratory Testing.

Statistical analysis of the data from tests performed will provide early warning if serious degradation trends develop. Annual evaluation of the propellant provides data for input into engineering reliability analysis for service life predictions.

B. BACKGROUND:

LGM-30 F and G testing was started in 1966 with phase testing at 24 month intervals (Report Numbers 78 - zero time; 104, 162, 185-Phase I: 176, 239, 257-Phase II; 271-Phase III). Report Number 257 was the first time that LGM-30 F and G data were statistically analyzed separately from LGM-30A and B data. The present report is a continuation of testing and statistical analysis.

Zero time testing for LGM-30A, B, F and G was started as soon as possible after receipt of the propellant by MANCP. Data from these tests were used to establish a base line for each test parameter.

The LGM-30F and G propellant test matrix (Table 1) is used to determine the number of specimens to be taken from each propellant loaf and the specific test or tests to which these specimens are to be subjected. Very low rate and low rate tensile specimens are taken on all LGM-30F and G blocks. Specimens for other physical and combustion tests are taken from every third (LGM-30F and G) block.

TABLE 1

SAMPLE PLAN

The Procedure for determining tests to be performed on propellant batch samples of LGM-30 F & G First Stage Motors are as follows:

1. Divide the USAF motor serial numbers into three groups by dividing the last three digits of each serial number by three to determine the remainder integer, e.g., 154 ÷ 3 = 51 with a remainder integer of 1.

2. Use the remainder integer to enter the following matrix to determine the group of tests to be performed on the forward, middle, and aft batch samples associated with a particular motor serial number.

GROUP MATRIX

TP-H1011 PROPELLANT BATCH SAMPLE	GROUP I	GROUP II	GROUP III
Forward	1	2	0
Middle	0	1	2
Aft	2	0	1

Each group will receive the following tests:

TEST MATRIX

GROUP I	GROUP II	GROUP III
High Rate Triaxial	Dynamic Response	High Rate Hydrostatic
Creep	Stress Relaxation	Sol Gel
Biaxial Low Rate	Burning Rate	DSC
TCLE	Heat of Explosion	TGA
Hardness	Pressure Time	DTA
Ignitability		Impact

NOTE: Low Rate and Very Low Rate Tensile tests are performed on all blocks.

STATISTICAL APPROACH

In order to determine aging trends for shelf/service life predictions, as directed by Service Engineering, First Stage LGM-30 F and G Minuteman TP-H1011 propellant blocks have been undergoing testing since 1966, statistically analyzed and reported on a regular test cycle by this laboratory.

The primary reason for performing statistical analysis on test data is for the detection of propellant changes due to aging that would affect motor reliability. Regression analysis was the method used to examine data and to aid in drawing conclusions about dependency relationships that may exist i.e., relationship between age versus test results.

In selecting the best fit model for the regression equation, the linear model $Y = a + bX$ was found to be the best fit model for 96% of the regression plots. The model used is shown in the regression equation at the top of every regression plot and those which are not linear will also be listed and discussed in the test results section.

Individual data points from different time periods were used to establish a least squares trend line for the data. The variance about the regression line, obtained using individual values of the dependent variable, was used to compute a tolerance interval such that at the 90% confidence level 90% of the sample distribution falls within this interval. This tolerance interval was extrapolated to a maximum of 24 months into the future from age of the oldest motor tested. The 't' value and the

significance of this statistic, which are reported for each regression model, give an indication of the "statistical significance" of the slope of the trend line as compared to a line of zero slope. Data were plotted by computer. The 'y' axis is computed so that the values at one inch intervals are peculiar to the data spread of the parameter tested. Plotted data points represent means at the particular ages at which testing occurred. The number of specimens at each age point is indicated on the sample size summary sheet accompanying the regression plot. Variance at each test age can be determined by consulting the G085 data storage system.

A post cure effect (propellant stabilizing after the first year or two) has been observed on some of the early test data (stress relaxation at -65°F, -40°F, and 20°F; TGA percent weight loss at 250°C; DTA exotherm 1, and exotherm 2); which tended to bias and skew the projected trend lines. To overcome this factor, two methods of analysis were performed: First, where possible, non-linear models were used that would best fit the total data (TGA) % weight loss at 250°C, DTA exotherm 1 and exotherm 2 data); second, where non-linear models did not fit the data as good as the linear model this early data was eliminated (Stress Relaxation at -60°F, -40°F, and 20°F data). By compensating for this post cure biasing a more accurate aging trend line for service life prediction is provided.

TEST RESULTS

VERY LOW RATE TENSILE:

Very low rate regressions show no significant change for strain at maximum stress with strain at rupture showing a statistically significant decrease. The stresses and modulus show a statistically significant increase (Figures 1 thru 5). The trends are gradual for the respective regressions and no operational problems from the propellant are expected for at least two years beyond the last test date.

LOW RATE BIAXIAL TENSILE:

The strain regressions show a statistically significant gradual decrease. The stresses and modulus show a statistically significant increase (Figures 6 thru 10).

LOW RATE TENSILE:

Low rate tensile data regressions show a statistically significant gradual decrease for strains and a statistically significant increase for stresses and modulus (Figures 11 thru 15).

HIGH RATE TRIAXIAL TENSILE:

The strain at maximum stress, strain at rupture and modulus regressions show a statistically significant decrease. Maximum stress and stress at rupture do not show a significant change (Figures 16 thru 20).

HIGH RATE HYDROSTATIC TENSILE:

The strains show a statistically significant decrease and the stresses show a statistically significant increase. The modulus did not show a significant change (Figures 21 thru 25).

TENSILE SUMMARY:

The test data regressions show that the strain is gradually decreasing and the stress and modulus gradually increasing.

Based on the analysis of test data regressions, it does not appear that meaningful degradation is occurring at this time and no operational problems are expected in the propellant for at least two years beyond the last data point.

STRESS RELAXATION MODULUS:

For the 0.5% strain at -65°F, the regressions for data at 10, 50 and 100 seconds show a statistically significant gradual increase with the 1000 second regression showing no significant change (Figures 26 thru 29).

At -40°F, the 10, 50, 100 and 1000 second regressions show a statistically significant decrease (Figures 30 thru 33).

The 3% strain regressions at 20°F, 77°F, 100°F, 140°F, and 180°F show a statistically significant gradual increase except for the 20°F at 10 second regression which does not show a change (Figures 34 thru 53).

SOL GEL:

The percent extractables and density do not show a significant change. Gel swell ratio and crosslink density regressions show a statistically significant increase (Figures 54 thru 57).

CONSTANT STRAIN:

A statistically significant gradual decrease is shown for constant strain (Figure 58).

HARDNESS:

Shore A ten second hardness shows a statistically significant increase (Figure 59).

SUMMARY OF SOL GEL, TENSILE AND HARDNESS DATA:

The crosslink density, constant strain and hardness data regressions correlate with the tensile data. As the polymer continues to crosslink, the strains decrease and the stresses and hardness increases.

PRESSURE TIME:

Maximum pressure and time to maximum pressure shows a statistically significant gradual decrease (Figures 60 and 61).

TCLE (Thermal Coefficient of Linear Expansion)

The thermal coefficient of linear expansion for both above and below the glass transition point (Tg) shows a statistically significant gradual increase (Figures 62 and 63).

TGA (Thermal Gravimetric Analysis):

A statistically significant increase is shown for the ignition temperature (9°C rise/min) and the percent weight loss at 250°C hold (12°C rise/min to

hold) with the weight loss at ignition showing no significant change (Figures 64 thru 66). The model $Y = a + b\left(\frac{1}{X}\right)$ was found to better represent the data than the linear model in Figure 66.

DTA (Differential Thermal Analysis):

The endotherm and first and second exotherms show a statistically significant decrease. The third exotherm and ignition temperature shows a statistically significant increase (Figures 67 thru 71). The model Y = a + b (LOG X) was found to better represent the data on Figures 68 and 69 than the linear model.

BURNING RATE:

The burning rate shows a statistically significant gradual increase (Figure 72).

THERMAL AND COMBUSTION SUMMARY:

The time to maximum from the pressure time data and burning rate data show a correlation. In both cases, the regressions show a gradual increase in rate of reaction.

The ignition temperatures for TGA and DTA show a gradual increase.

From the analyses of the regressions, no combustion problems are expected for at least two years beyond the oldest data point.

CONCLUSIONS

Thirteen years of aging at ambient temperature (77°F) has not greatly changed the properties of the propellant. Some test parameters indicate slight aging trends, but nothing that would adversely affect the operational characteristics of the rocket motor propellant.

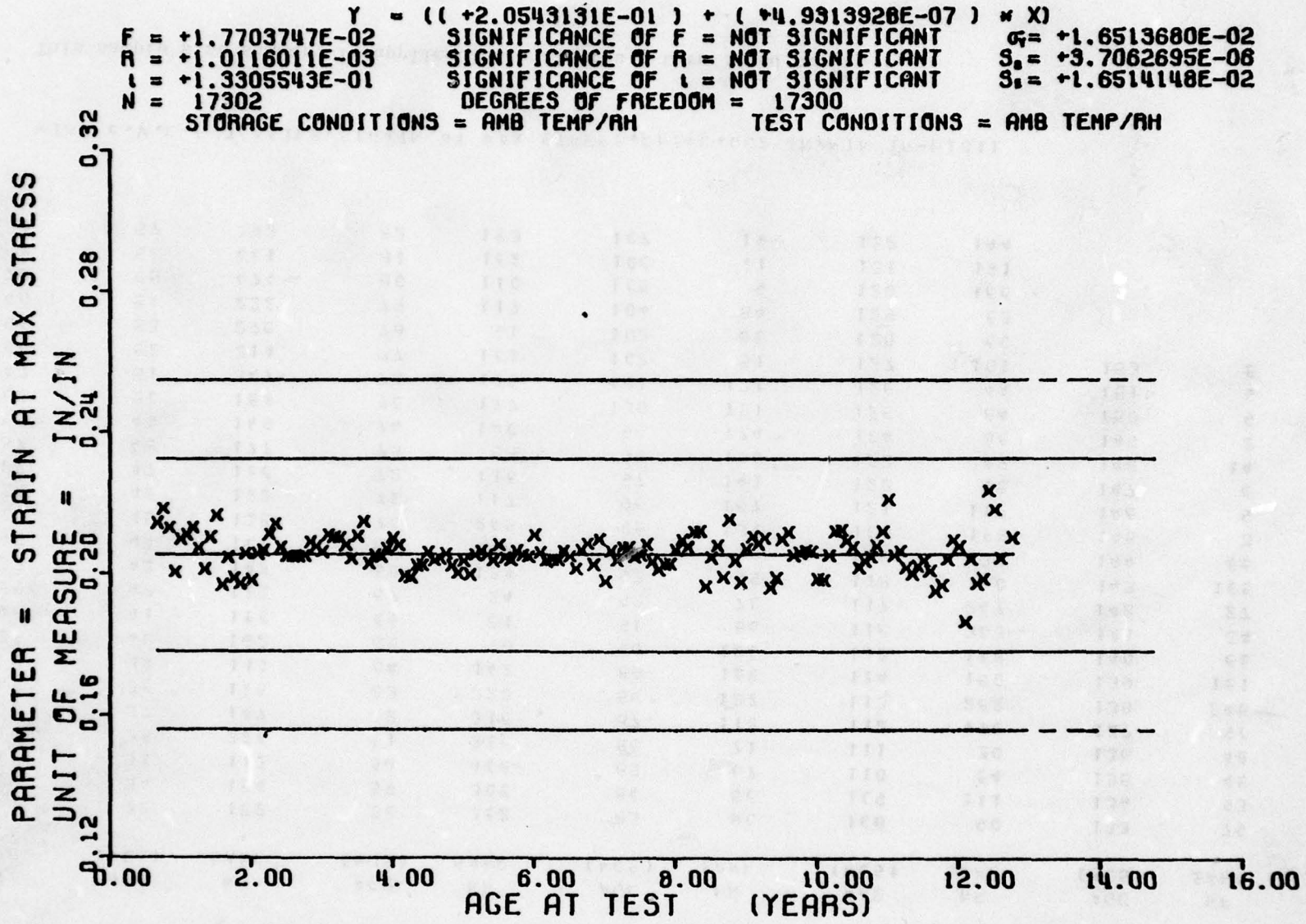
From the statistical analysis, it does not appear that significant propellant degradation is occurring. Based on thirteen years of accumulated data, there is no reason to suspect that properties will show much change for at least two years past the last data point. Therefore, propellant reliability should not change appreciably over that time period. Since failure limits are not available for the parameters tested, this statement is based on the fact that the slope of the regression curves where statistically significant are, with few exceptions, relatively flat or close to the line of zero slope and have not changed appreciably from the last test period.

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	33	152	58	352	83	80	108	90	133	79
9	19	34	154	59	305	84	56	109	111	134	93
10	11	35	113	60	406	85	67	110	54	135	48
11	15	36	226	61	266	86	71	111	30	136	48
12	30	37	147	62	316	87	113	112	118	137	90
13	48	38	126	63	228	88	127	113	282	138	246
14	28	39	119	64	142	89	159	114	150	139	151
15	36	40	122	65	90	90	129	115	118	140	66
16	46	41	156	66	61	91	86	116	303	141	34
17	55	42	123	67	24	92	70	117	247	142	27
18	28	43	142	68	134	93	99	118	140	143	165
19	49	44	106	69	198	94	90	119	133	144	66
20	24	45	135	70	245	95	131	120	196	145	3
21	56	46	122	71	117	96	167	121	117	146	9
22	27	47	166	72	116	97	141	122	15	147	6
23	67	48	177	73	83	98	150	123	42	148	14
24	55	49	199	74	140	99	174	124	36	149	3
25	63	50	188	75	177	100	151	125	84	150	9
26	47	51	347	76	135	101	121	126	44	151	9
27	50	52	314	77	161	102	51	127	101	153	5
28	56	53	295	78	91	103	55	128	60		
29	40	54	232	79	117	104	54	129	63		
30	73	55	474	80	110	105	9	130	166		
31	88	56	461	81	152	106	11	131	191		
32	153	57	392	82	153	107	19	132	144		

WING E.V.L.F.TENSILE,STRAIN AT MAX STRESS,CPS=0.002 IN/MIN TP-H1011

This sample size summary is applicable to figures 1 thru 3 and 5.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UNIT OF MEASURE = IN/IN
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0.20
0.24
0.28
0.32
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
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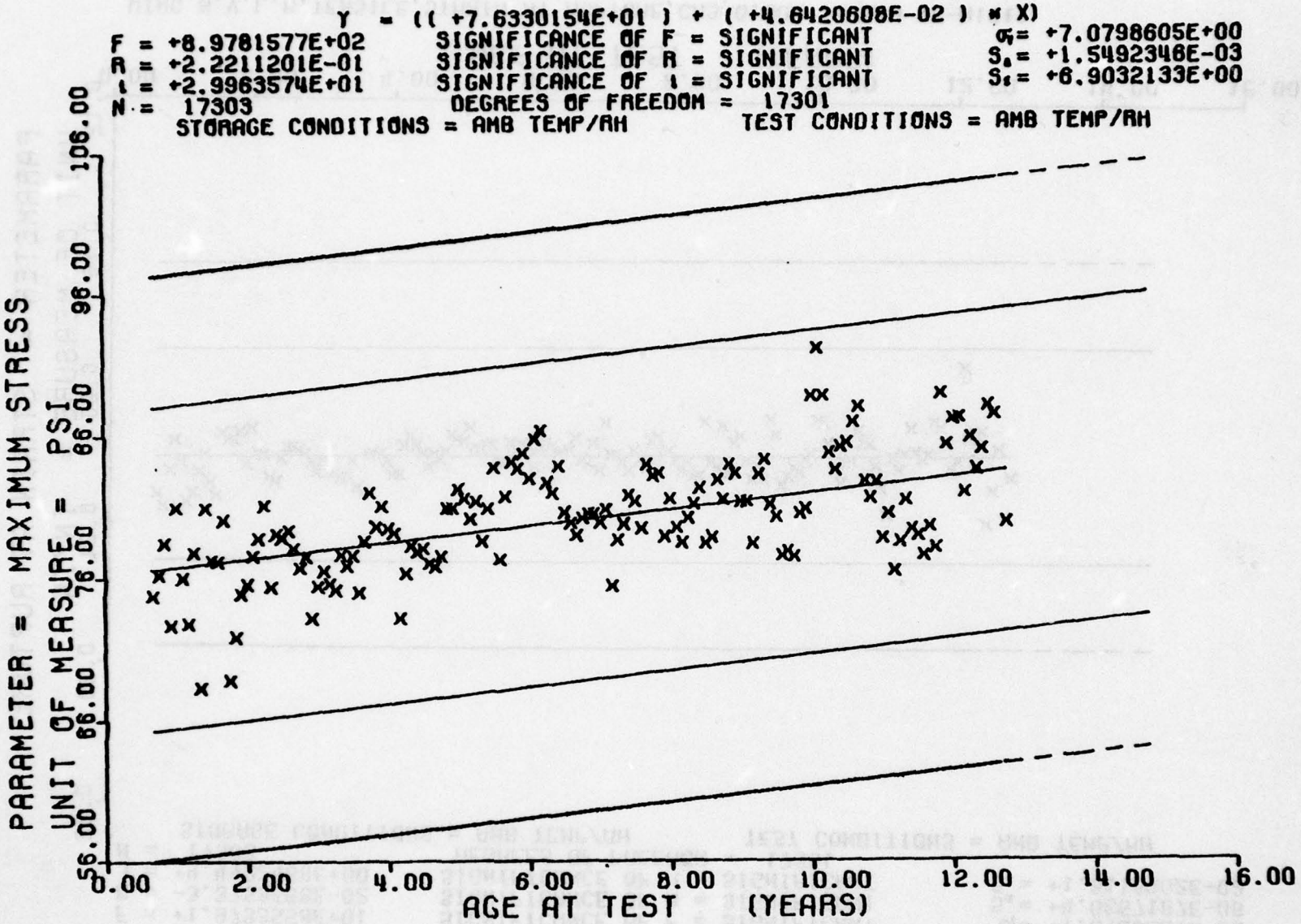
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,STRAIN AT MAX STRESS,CHS=0.002 IN/MIN TP-H1011

Figure 1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10.00
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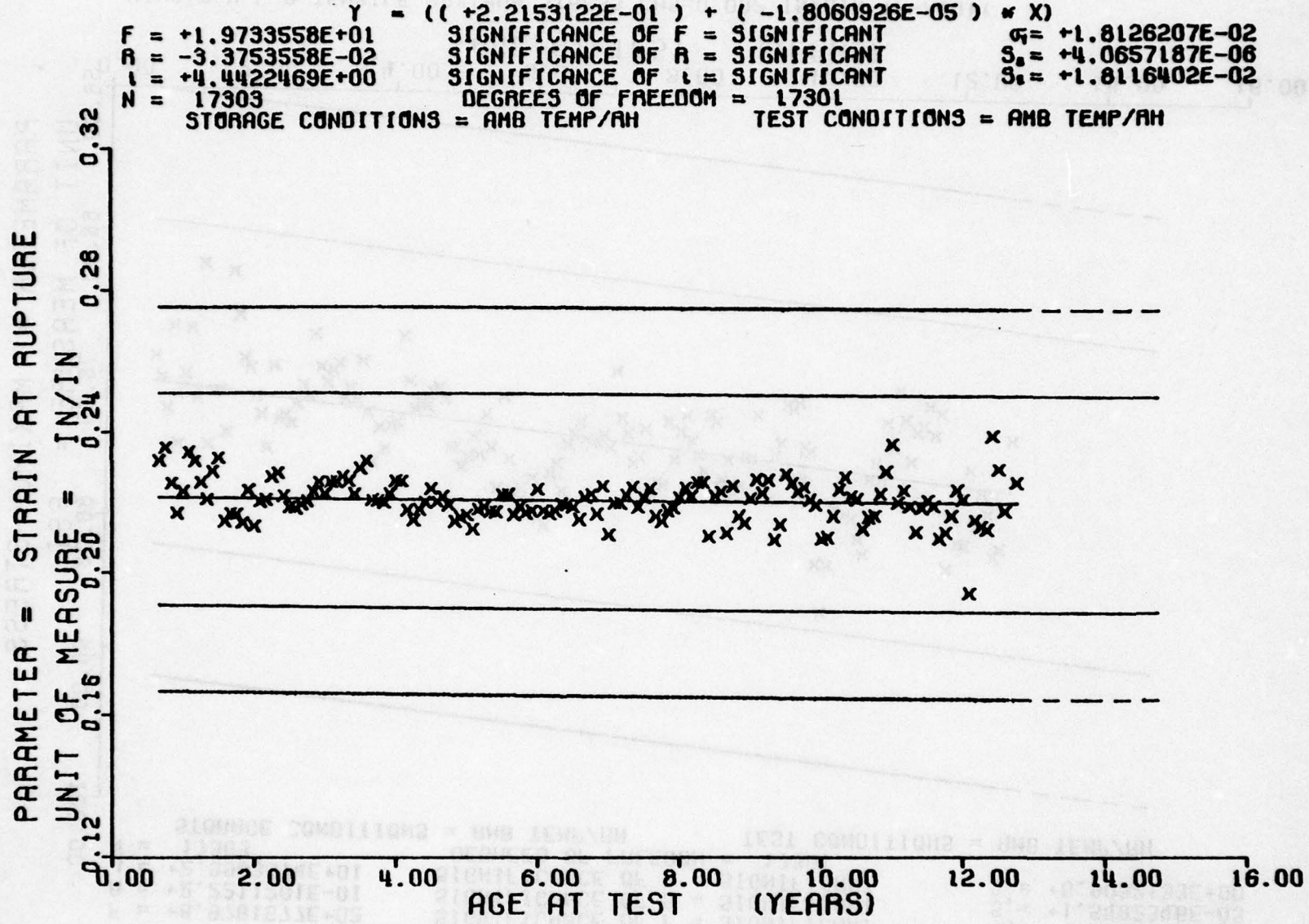
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,MAXIMUM STRESS,CHS=0.002 IN/MIN TP-H1011

Figure 2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PARAMETER = STRAIN AT RUPTURE
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0.28
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0.00
2.00
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6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,STRAIN AT RUPTURE,CHS=0.002 IN/MIN TP-H1011

Figure 3

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	33	140	58	276	83	80	108	90	133	79
9	19	34	139	59	238	84	56	109	111	134	93
10	11	35	110	60	318	85	67	110	54	135	45
11	15	36	216	61	222	86	70	111	30	136	48
12	30	37	138	62	286	87	113	112	118	137	90
13	48	38	111	63	208	88	127	113	282	138	246
14	28	39	110	64	138	89	159	114	151	139	151
15	38	40	116	65	90	90	129	115	118	140	66
16	46	41	149	66	61	91	86	116	303	141	34
17	55	42	115	67	24	92	70	117	247	142	27
18	28	43	120	68	134	93	99	118	140	143	185
19	49	44	103	69	198	94	90	119	133	144	66
20	24	45	138	70	246	95	131	120	198	145	3
21	56	46	122	71	117	96	167	121	117	146	9
22	27	47	166	72	116	97	141	122	15	147	6
23	67	48	177	73	83	98	150	123	42	148	14
24	55	49	199	74	140	99	174	124	36	149	3
25	63	50	168	75	177	100	151	125	84	150	9
26	47	51	347	76	135	101	121	126	44	151	9
27	50	52	314	77	161	102	51	127	101	153	5
28	56	53	295	78	91	103	55	128	60		
29	40	54	232	79	117	104	54	129	63		
30	73	55	474	80	110	105	9	130	166		
31	82	56	461	81	152	106	11	131	191		
32	148	57	362	82	153	107	19	132	144		

WING C.V.L.F.TENSILE,STRESS AT RUPTURE,CHS=C.C02 IN/MIN TF-H1011

This sample size summary is applicable to figure 4.

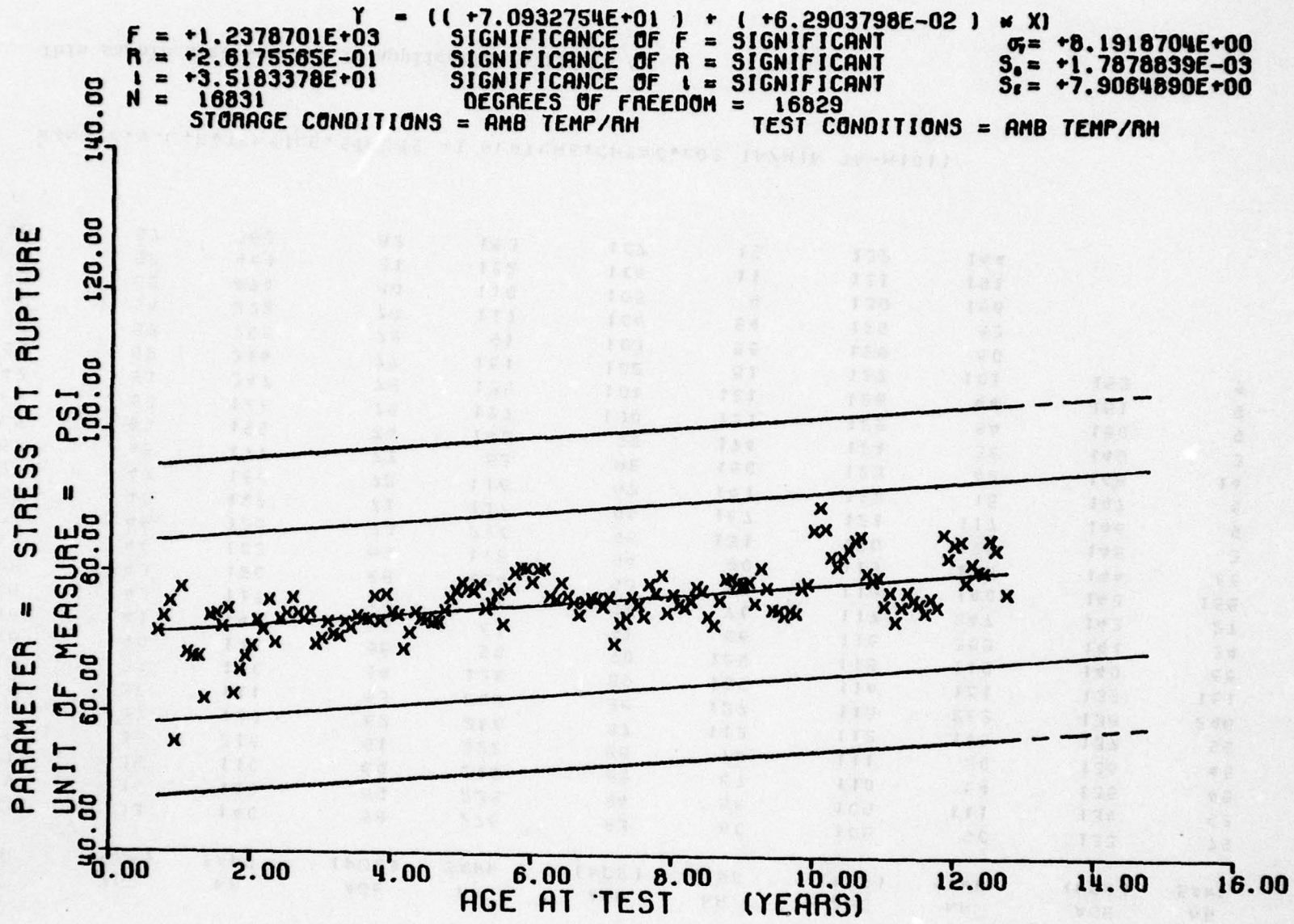

Y = ((+7.0932754E+01) + (+6.2903798E-02) * X)
F = +1.2378701E+03
SIGNIFICANCE OF F = SIGNIFICANT
σ_r = +8.1918704E+00
R = +2.6175565E-01
SIGNIFICANCE OF R = SIGNIFICANT
S_a = +1.7878839E-03
I = +3.5183378E+01
SIGNIFICANCE OF I = SIGNIFICANT
S_ε = +7.9064890E+00
N = 16831
DEGREES OF FREEDOM = 16829
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI
140.00
120.00
100.00
80.00
60.00
40.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,V.L.A.TENSILE,STRESS AT RUPTURE,CHS=0.002 IN/MIN TP-H1011

Figure 4

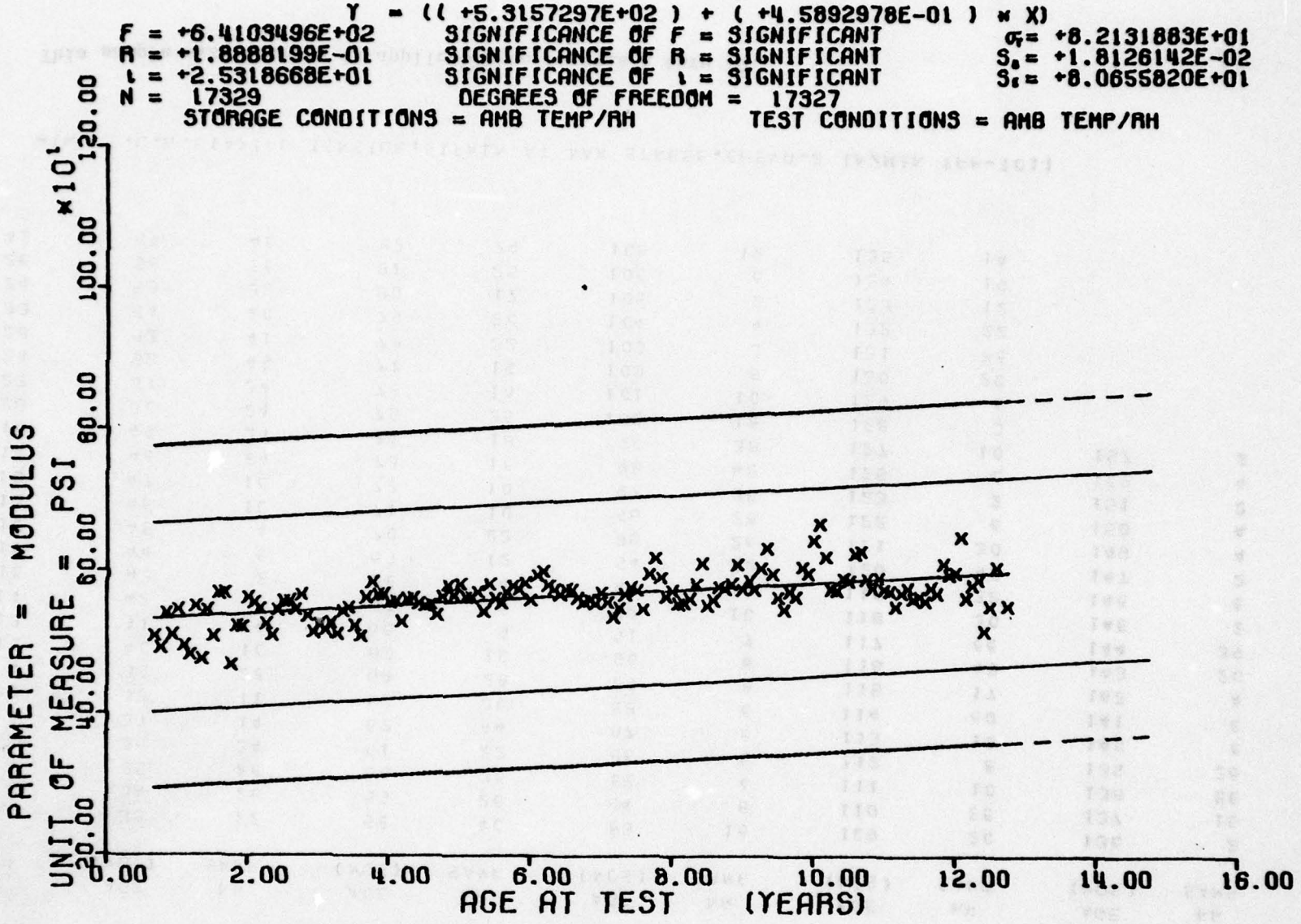

Y = ((+5.3157297E+02) + (+4.5892978E-01) * X)
F = +6.4103496E+02 SIGNIFICANCE OF F = SIGNIFICANT
R = +1.8888199E-01 SIGNIFICANCE OF R = SIGNIFICANT
N = 17329 DEGREES OF FREEDOM = 17327
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI
120.00
100.00
80.00
60.00
40.00
20.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,MODULUS,CHS=0.002 IN/MIN TP-H1011

Figure 5

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
1	1	33	22	58	40	83	16	109	20	136	2
8	2	34	26	59	26	84	8	110	28	137	18
9	4	35	26	60	38	85	4	111	10	138	58
11	6	36	34	61	22	86	5	112	8	139	36
12	14	37	14	62	44	87	6	113	13	140	6
13	22	38	11	63	36	88	6	114	60	141	8
14	4	39	28	64	29	89	8	115	17	142	4
15	16	40	16	65	10	90	6	116	48	143	20
16	12	41	14	66	9	91	7	117	66	144	39
17	14	42	8	67	6	92	10	118	30	145	2
18	16	43	2	68	4	93	10	119	32	146	6
19	14	44	5	69	12	94	23	120	42	147	2
20	16	45	4	70	22	95	26	121	30	149	4
21	12	46	10	71	10	96	28	122	6	150	4
22	10	47	16	72	10	97	35	123	2	151	2
23	13	48	24	73	16	98	48	125	6	152	4
24	16	49	34	74	18	99	38	127	10	157	2
25	28	50	24	75	35	100	18	128	3		
26	22	51	34	76	14	101	10	129	6		
27	24	52	49	77	19	102	8	130	20		
28	28	53	41	78	22	103	3	131	76		
29	23	54	20	79	20	104	4	132	22		
30	26	55	32	80	17	105	2	133	12		
31	26	56	36	81	25	106	6	134	19		
32	42	57	40	82	24	108	12	135	14		

WING E.L.R.BIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=0.2 IN/MIN TEM-1011

This sample size summary is applicable to figures 6 thru 10.

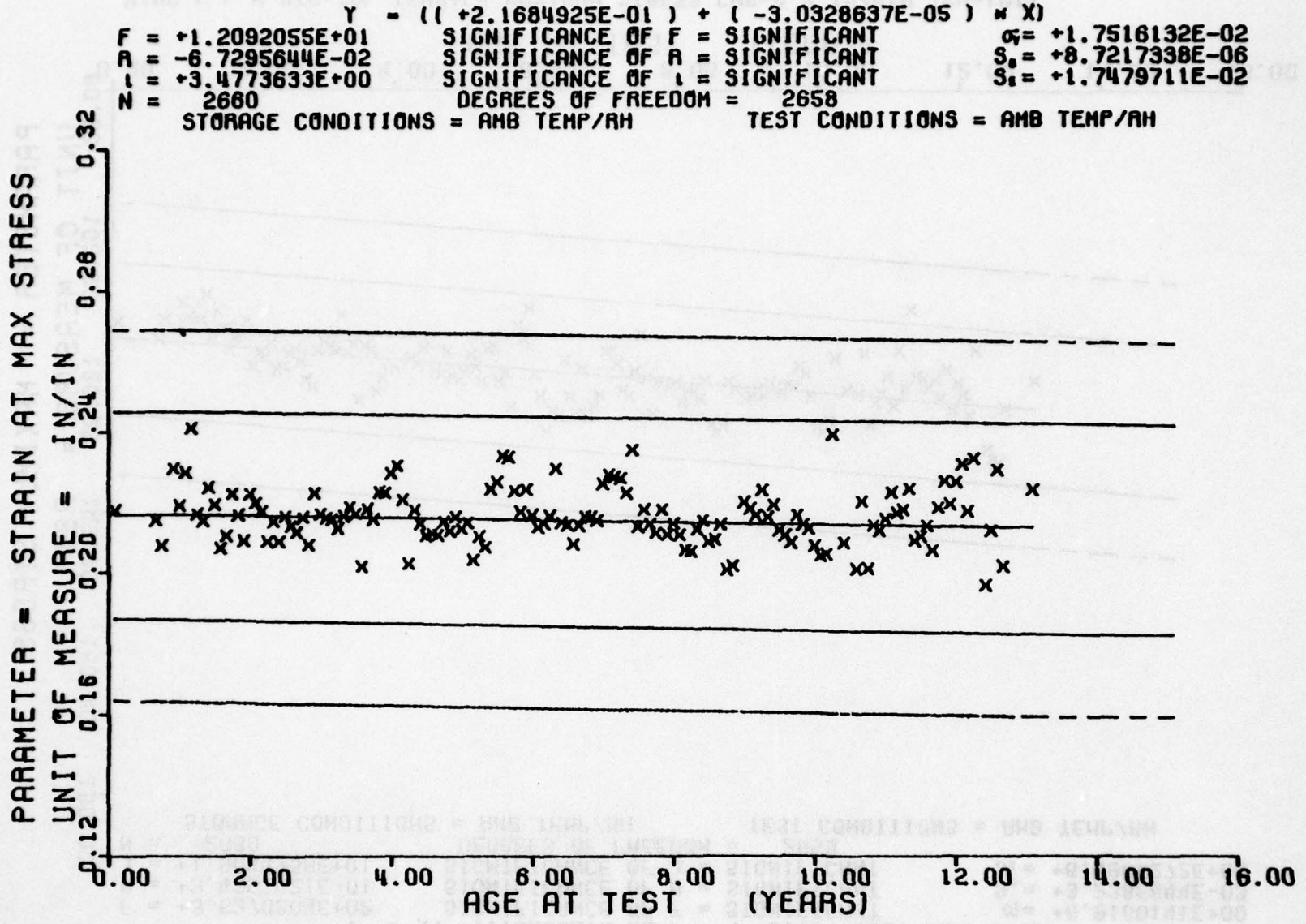

Y = ((+2.1684925E-01) + (-3.0328637E-05) * X)
F = +1.2092055E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.7516132E-02
A = -6.7295644E-02 SIGNIFICANCE OF A = SIGNIFICANT S = +8.7217338E-06
B = +3.4773633E+00 SIGNIFICANCE OF B = SIGNIFICANT S = +1.7479711E-02
N = 2660 DEGREES OF FREEDOM = 2658
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.12
0.16
0.20
0.24
0.28
0.32
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.A.BIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=0.2 IN/MIN TPH-1011

Figure 6

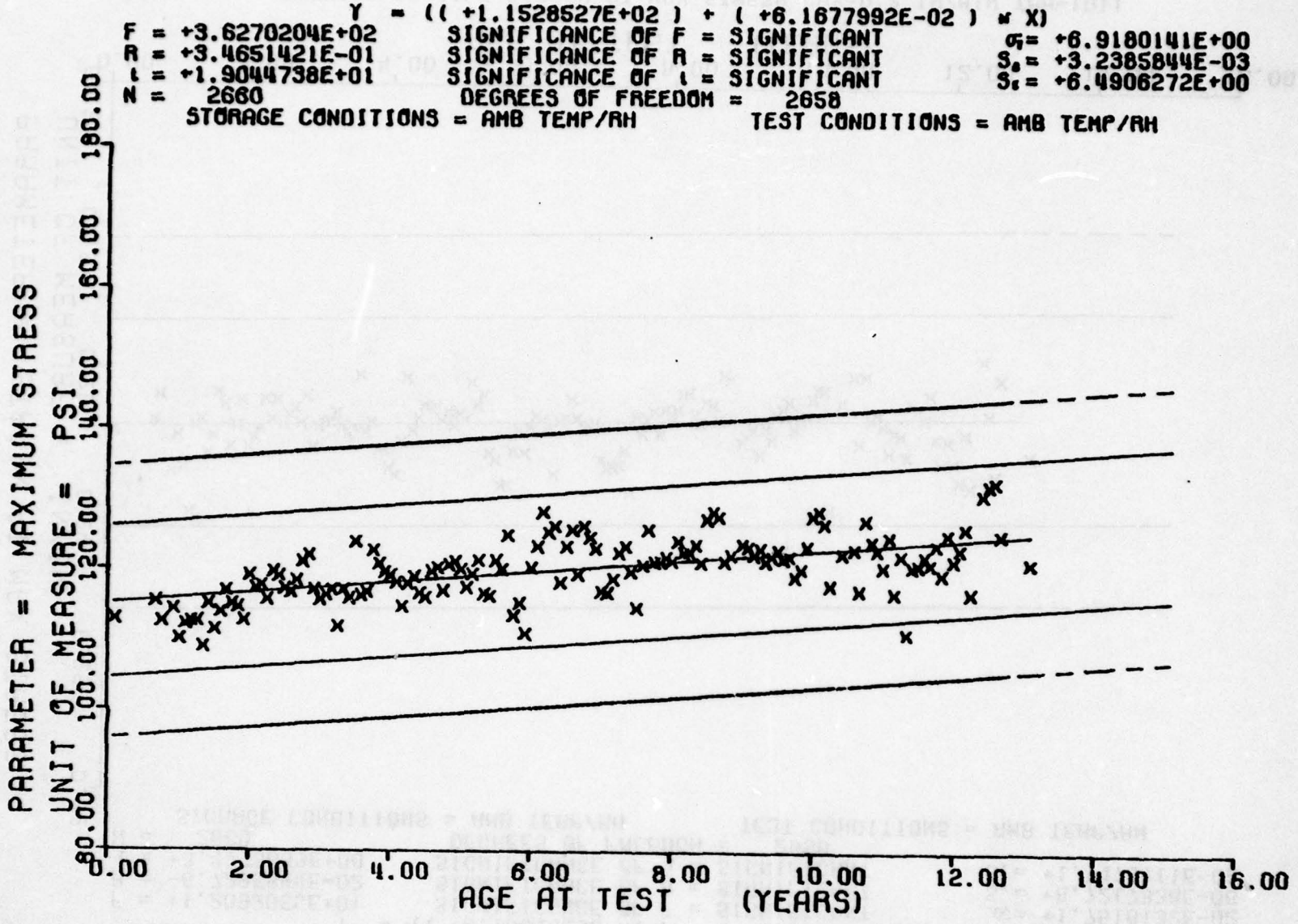

Y = ((+1.1528527E+02) + (+6.1677992E-02) * X)
F = +3.6270204E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +6.9180141E+00
R = +3.4651421E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +3.2385844E-03
t = +1.9044738E+01 SIGNIFICANCE OF t = SIGNIFICANT S = +6.4906272E+00
N = 2660 DEGREES OF FREEDOM = 2658
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI
80.00
100.00
120.00
140.00
160.00
180.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,MAXIMUM STRESS,CHS=0.2 IN/MIN TPH-1011

Figure 7

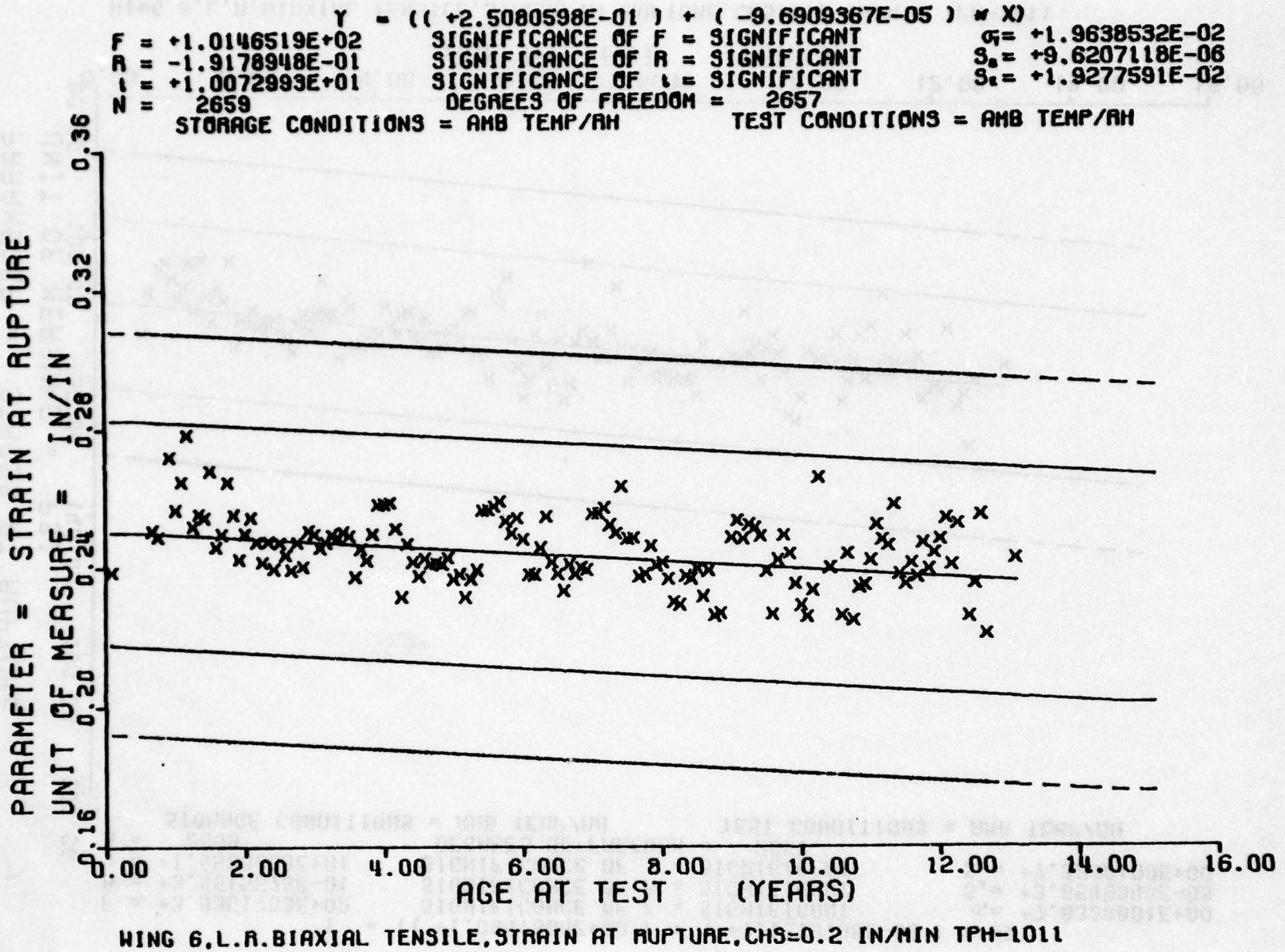

Y = ((+2.5080598E-01) + (-9.6909367E-05) * X)
F = +1.0146519E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.9638532E-02
R = -1.9178948E-01 SIGNIFICANCE OF R = SIGNIFICANT S_a = +9.6207118E-06
t = +1.0072993E+01 SIGNIFICANCE OF t = SIGNIFICANT S_t = +1.9277591E-02
N = 2659 DEGREES OF FREEDOM = 2657
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.36
0.32
0.28
0.24
0.20
0.16
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,STRAIN AT RUPTURE,CHS=0.2 IN/MIN TPH-1011

Figure 8

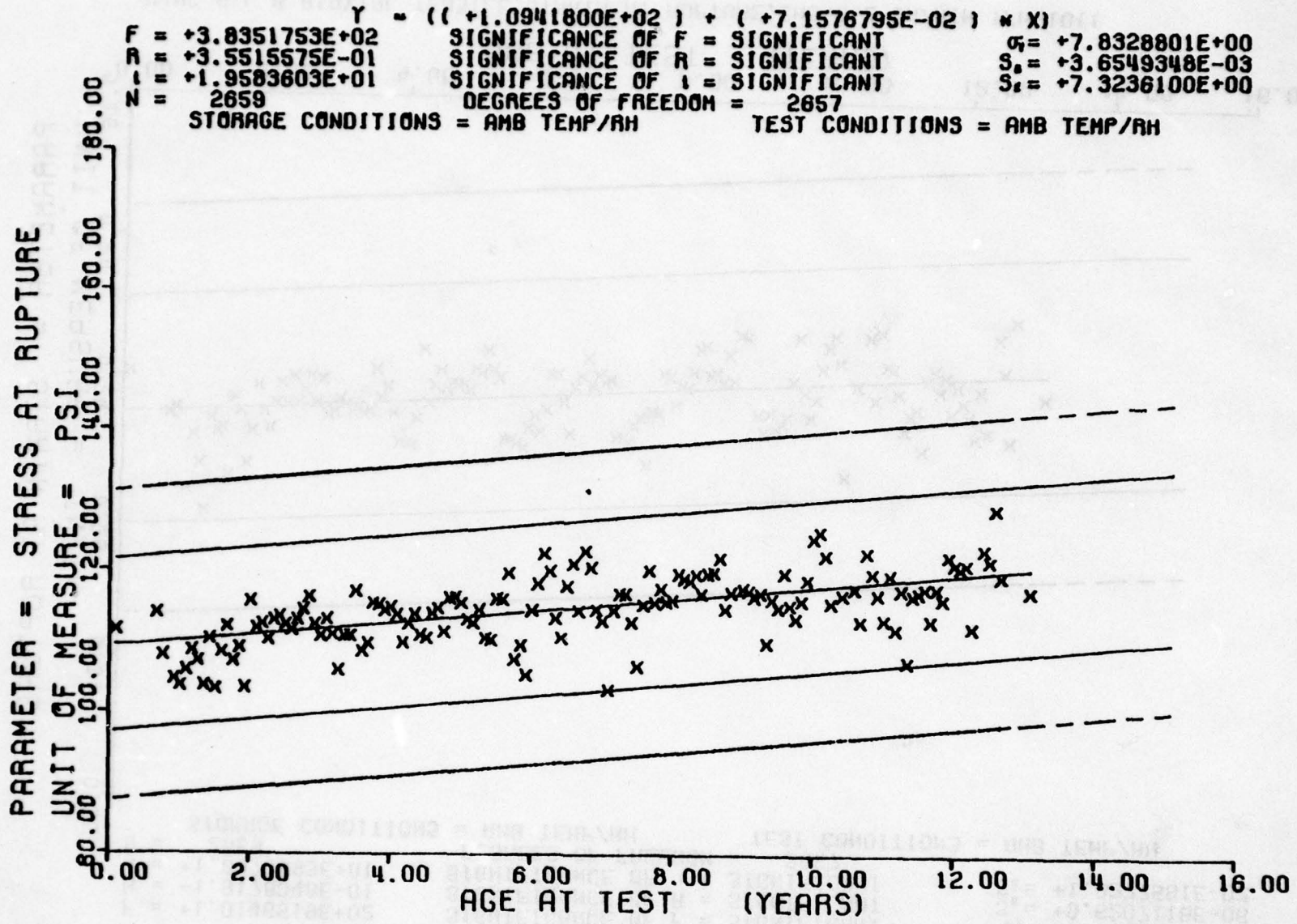

Y = ((+1.0941800E+02) + (+7.1576795E-02) * X)
F = +3.8351753E+02
SIGNIFICANCE OF F = SIGNIFICANT
σ = +7.8328801E+00
R = +3.5515575E-01
SIGNIFICANCE OF R = SIGNIFICANT
S = +3.6549348E-03
I = +1.9583603E+01
SIGNIFICANCE OF I = SIGNIFICANT
S = +7.3236100E+00
N = 2659
DEGREES OF FREEDOM = 2657
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI
80.00
100.00
120.00
140.00
160.00
180.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,STRESS AT RUPTURE,CHS=0.2 IN/MIN TPH-1011

Figure 9

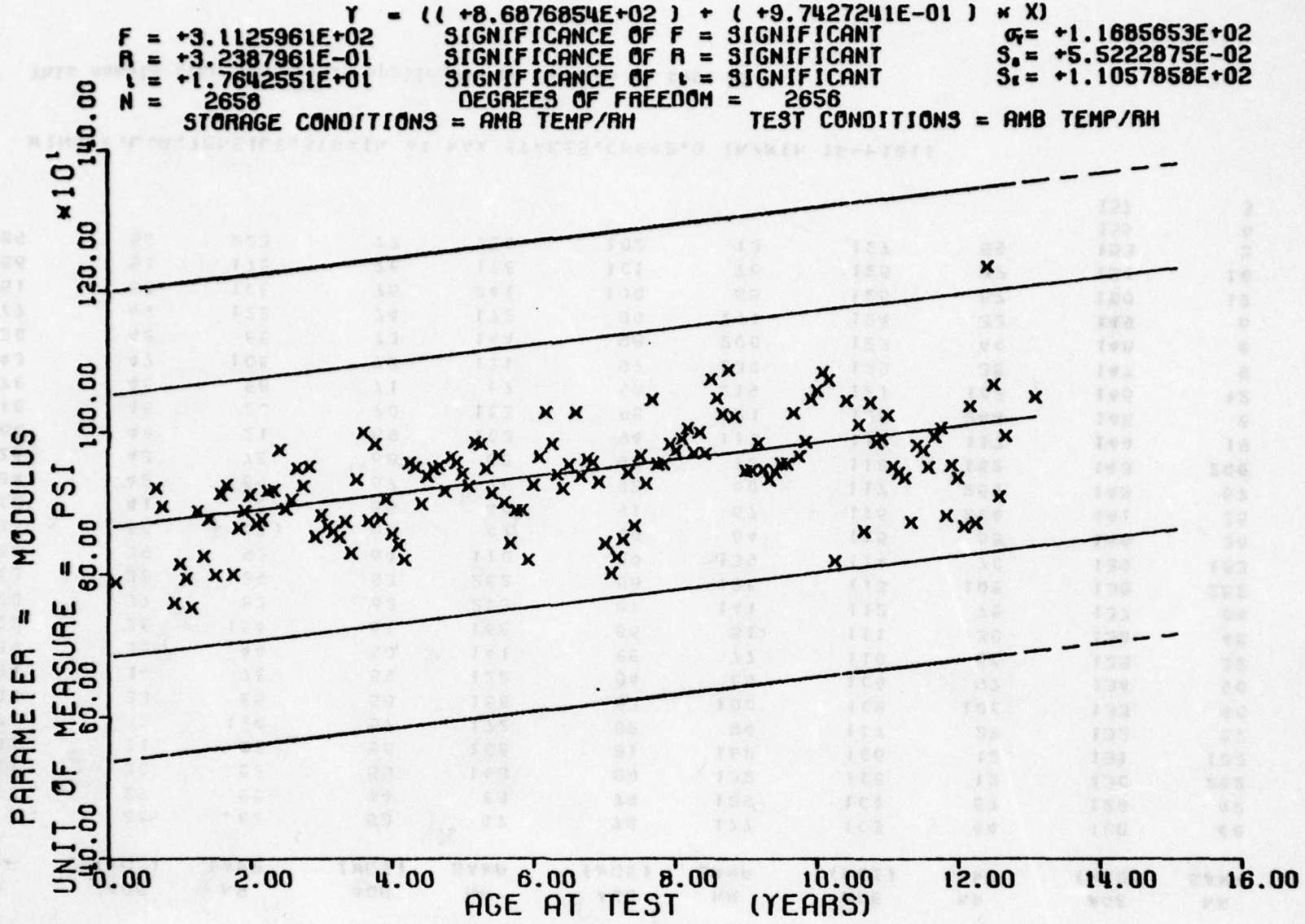

Y = ((+8.6876854E+02) + (+9.7427241E-01) * X)
F = +3.1125961E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.1685653E+02
R = +3.2387961E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +5.5222875E-02
t = +1.7642551E+01 SIGNIFICANCE OF t = SIGNIFICANT S = +1.1057858E+02
N = 2658 DEGREES OF FREEDOM = 2656
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI
*10
140.00
120.00
100.00
80.00
60.00
40.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,MODULUS,CHS=0.2 IN/MIN TPH-1011

Figure 10

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
2	3	28	82	53	97	78	177	103	44	128	68
4	57	29	55	54	83	79	129	104	57	129	42
5	151	30	52	55	143	80	132	105	12	130	252
6	191	31	82	56	108	81	162	106	12	131	132
7	171	32	124	57	172	82	94	107	27	132	82
8	143	33	85	58	156	83	100	108	105	133	40
9	194	34	78	59	122	84	69	109	97	134	90
10	189	35	44	60	141	85	77	110	56	135	32
11	192	36	154	61	166	86	51	111	30	136	45
12	220	37	83	62	203	87	141	112	75	137	84
13	213	38	39	63	262	88	126	113	105	138	252
14	222	39	93	64	110	89	139	114	70	139	153
15	223	40	65	65	61	90	84	115	68	140	34
16	212	41	35	66	40	91	67	116	264	141	35
17	184	42	69	67	76	92	80	117	261	142	57
18	26	43	75	68	65	93	72	118	152	143	208
19	60	44	21	69	103	94	113	119	117	144	18
20	18	45	20	70	153	95	121	120	244	145	6
21	78	46	58	71	87	96	219	121	103	146	12
22	43	47	106	72	131	97	230	122	35	147	9
23	30	48	85	73	144	98	200	123	40	148	6
24	77	49	122	74	172	99	141	124	33	149	6
25	51	50	106	75	241	100	65	125	57	150	12
26	56	51	175	76	156	101	76	126	72	151	10
27	59	52	223	77	154	102	13	127	59	153	3
										155	6
										157	3

WING E.L.R.TENSILE.STRAIN AT MAX STRESS.CHS=2.0 IN/MIN TF-H1011

This sample size summary is applicable to figures 11 thru 15

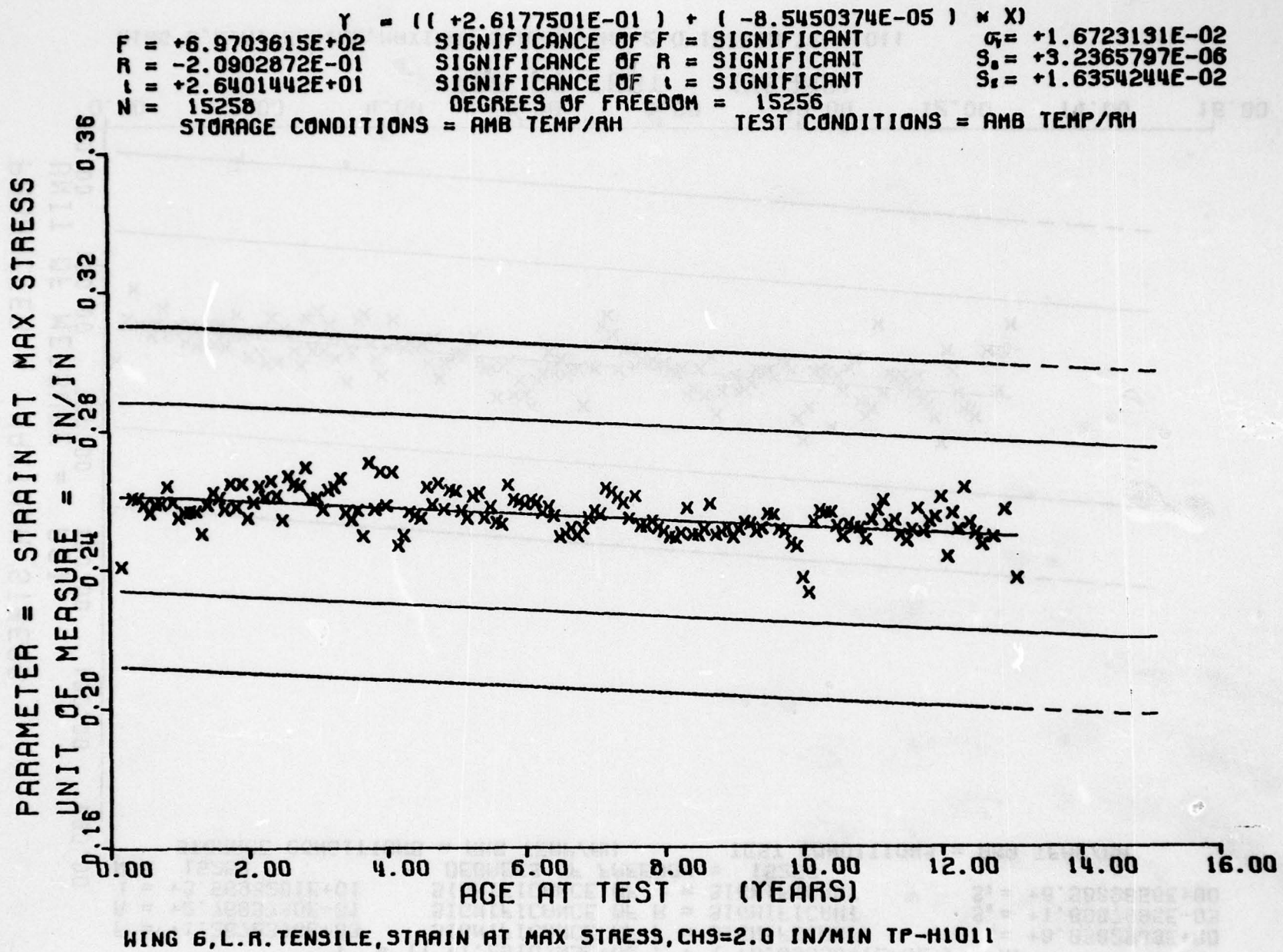

Y = ((+2.6177501E-01) + (-8.5450374E-05) * X)
F = +6.9703615E+02
SIGNIFICANCE OF F = SIGNIFICANT
σ = +1.6723131E-02
R = -2.0902872E-01
SIGNIFICANCE OF R = SIGNIFICANT
S = +3.2365797E-06
t = +2.6401442E+01
SIGNIFICANCE OF t = SIGNIFICANT
S = +1.6354244E-02
N = 15258
DEGREES OF FREEDOM = 15256
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.36
0.32
0.28
0.24
0.20
0.16
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,STRAIN AT MAX STRESS,CHS=2.0 IN/MIN TP-H1011

Figure 11

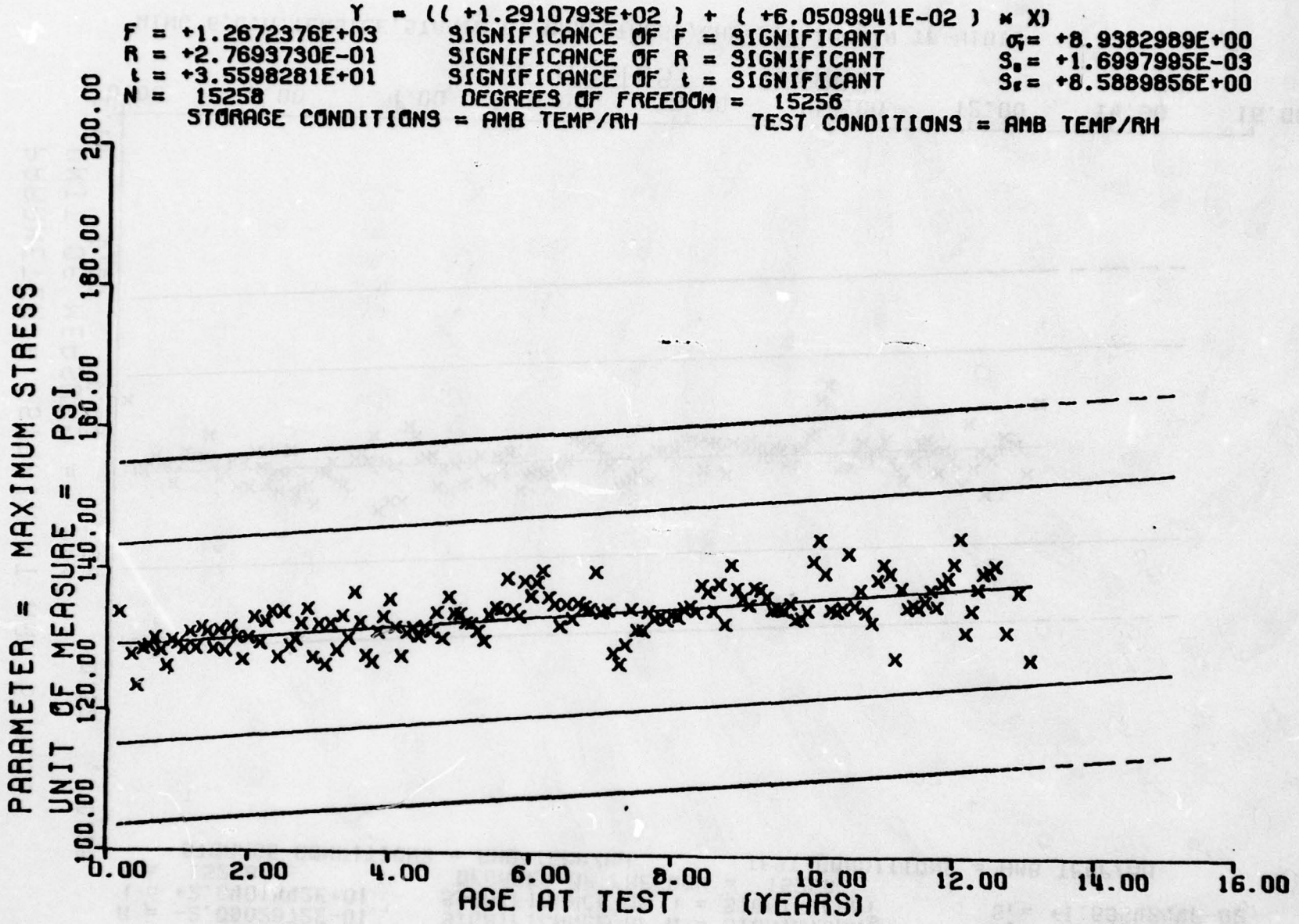

Y = ((+1.2910793E+02) + (+6.0509941E-02) * X)
F = +1.2672376E+03 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +8.9382989E+00
R = +2.7693730E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +1.6997995E-03
t = +3.5598281E+01 SIGNIFICANCE OF t = SIGNIFICANT S_E = +8.5889856E+00
N = 15258 DEGREES OF FREEDOM = 15256
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI
100.00
120.00
140.00
160.00
180.00
200.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,MAXIMUM STRESS,CHS=2.0 IN/MIN TP-H1011

Figure 12

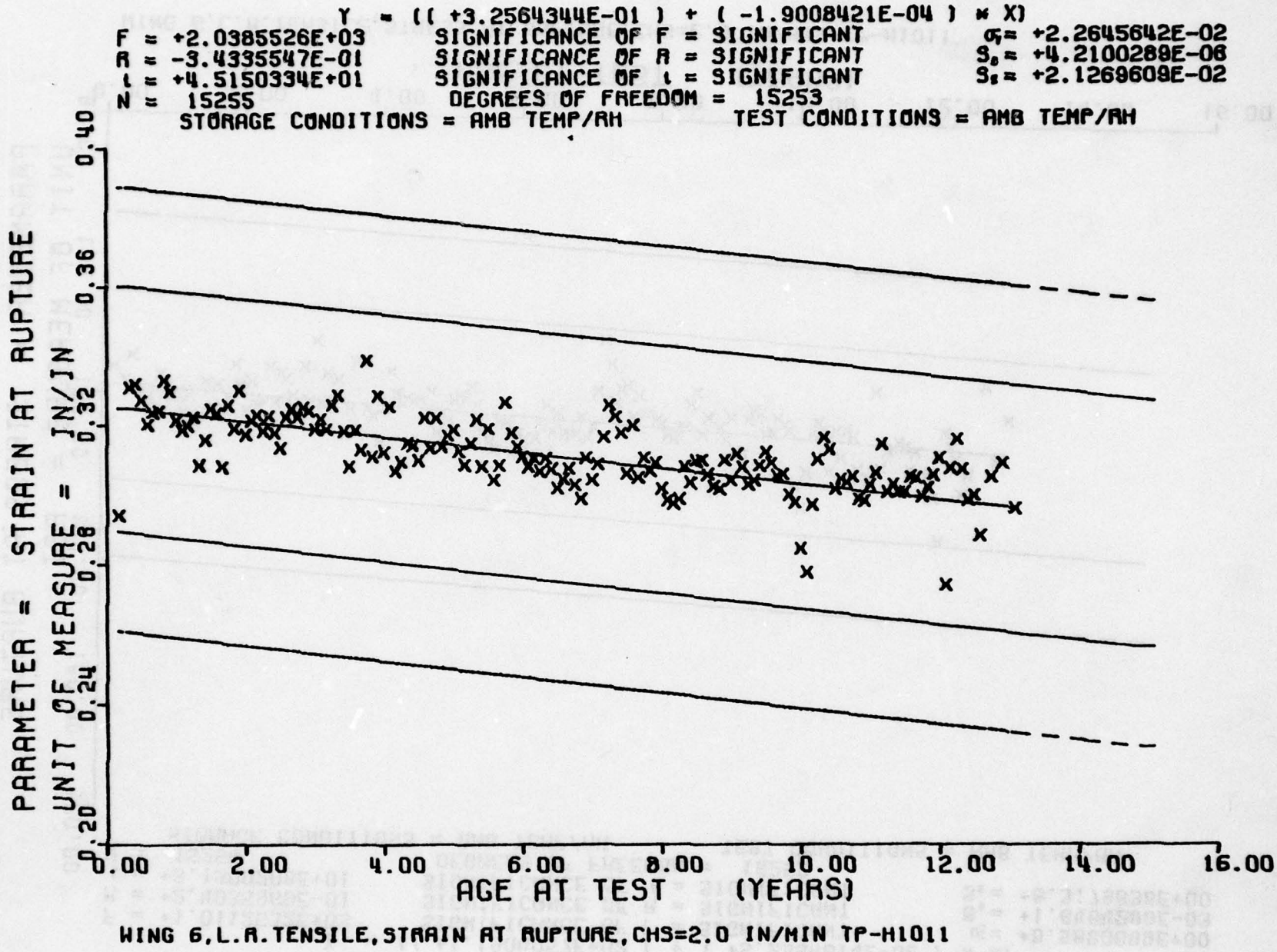

Y = ((+3.2564344E-01) + (-1.9008421E-04) * X)
F = +2.0385526E+03
SIGNIFICANCE OF F = SIGNIFICANT
σ = +2.2645642E-02
R = -3.4335547E-01
SIGNIFICANCE OF R = SIGNIFICANT
S = +4.2100289E-06
t = +4.5150334E+01
SIGNIFICANCE OF t = SIGNIFICANT
S = +2.1269609E-02
N = 15255
DEGREES OF FREEDOM = 15253
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.40
0.36
0.32
0.28
0.24
0.20
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,STRAIN AT RUPTURE,CHS=2.0 IN/MIN TP-H1011

Figure 13

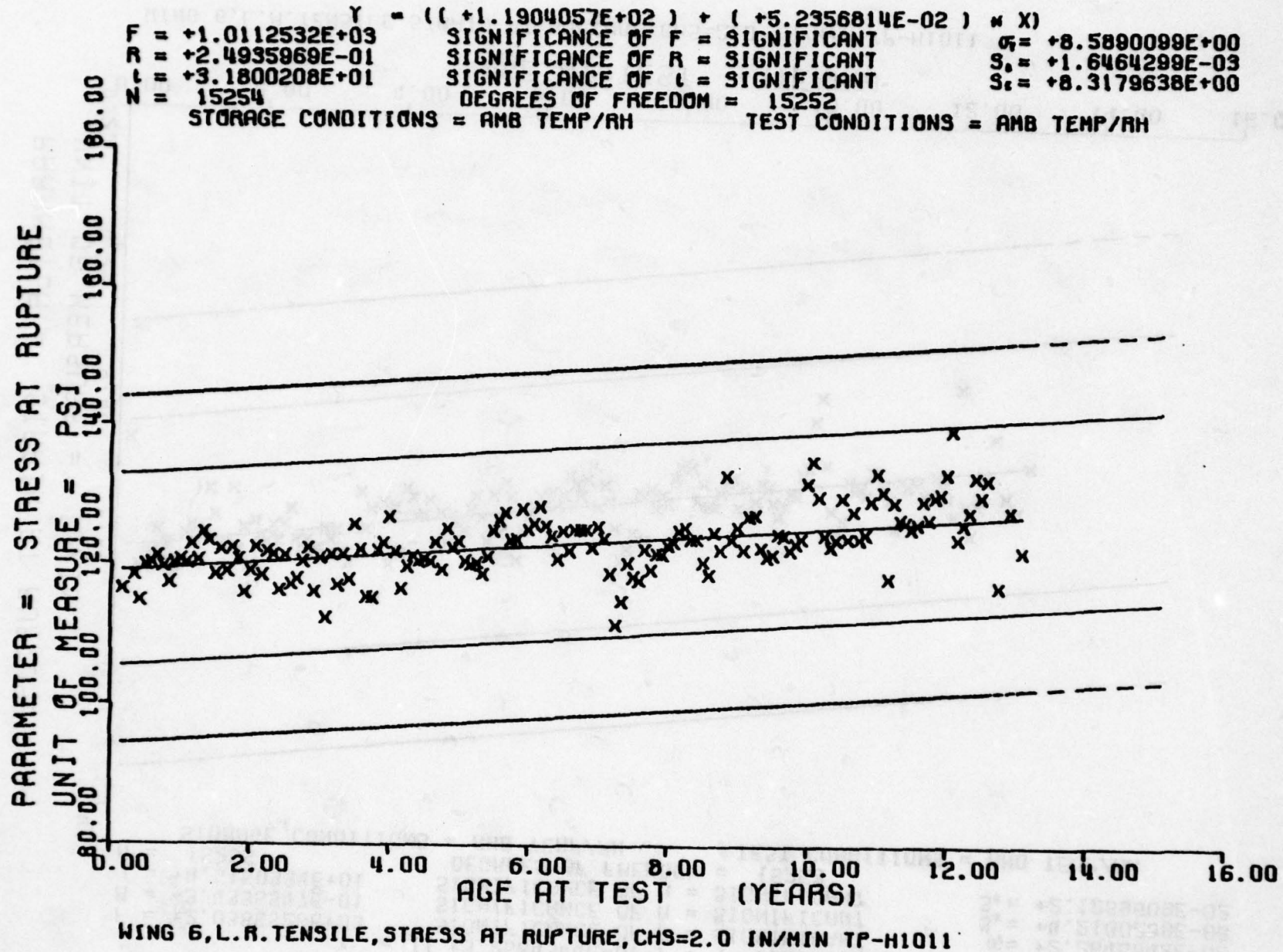

Y = ((+1.1904057E+02) + (+5.2356814E-02) * X)
F = +1.0112532E+03
R = +2.4935969E-01
t = +3.1800208E+01
N = 15254
SIGNIFICANCE OF F = SIGNIFICANT
SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF t = SIGNIFICANT
DEGREES OF FREEDOM = 15252
σf= +8.5890099E+00
Sb= +1.6464299E-03
Sε= +8.3179638E+00
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI
80.00
100.00
120.00
140.00
160.00
180.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,STRESS AT RUPTURE,CHS=2.0 IN/MIN TP-H1011

Figure 14

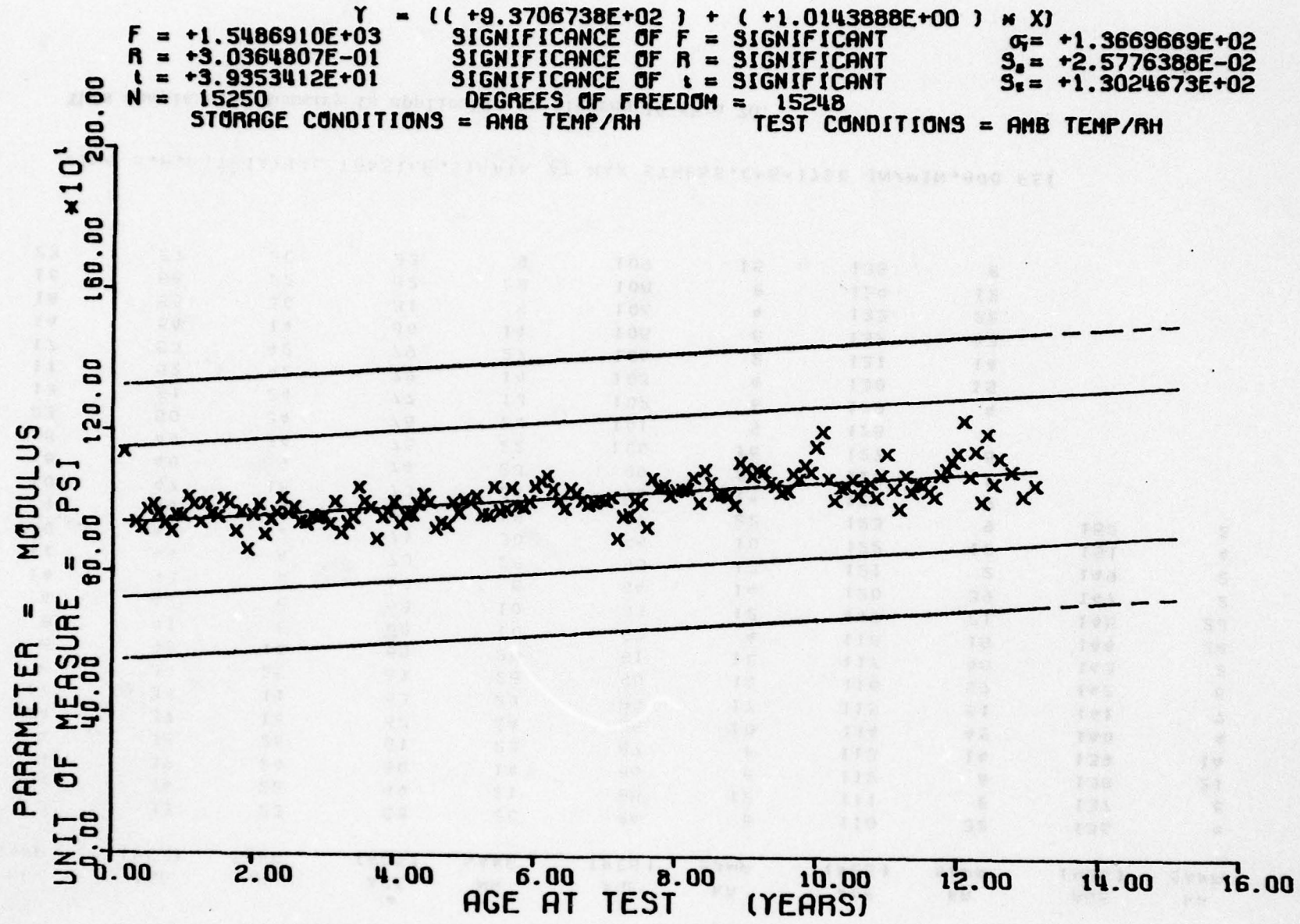

Y = ((+9.3706738E+02) + (+1.0143888E+00) * X)
F = +1.5486910E+03
SIGNIFICANCE OF F = SIGNIFICANT
σ_r = +1.3669669E+02
R = +3.0364807E-01
SIGNIFICANCE OF R = SIGNIFICANT
S_a = +2.5776388E-02
t = +3.9353412E+01
SIGNIFICANCE OF t = SIGNIFICANT
S_t = +1.3024673E+02
N = 15250
DEGREES OF FREEDOM = 15248
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI
*10^1
200.00
160.00
120.00
80.00
40.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,MODULUS,CHS=2.0 IN/MIN TP-H1011

Figure 15

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
1	2	33	23	58	30	84	6	110	32	136	4
8	2	34	22	59	21	85	12	111	8	137	8
9	4	35	24	60	14	86	6	112	6	138	21
11	4	36	26	61	23	87	8	113	14	139	14
12	14	37	16	62	24	88	10	114	45	140	4
13	17	38	11	63	23	89	17	115	51	141	7
14	6	39	25	64	28	90	15	116	57	142	6
15	6	40	10	65	20	91	18	117	40	143	2
16	8	41	8	66	10	92	4	118	19	144	38
17	4	42	6	68	10	93	12	119	21	145	23
18	14	43	2	69	6	94	14	120	39	147	2
19	11	44	4	70	28	95	12	121	2	149	2
20	20	45	2	71	30	96	10	122	12	151	4
21	4	46	6	72	15	97	22	123	9	152	2
22	10	47	18	73	24	98	16	124	2		
23	6	48	9	74	23	99	26	125	2		
24	8	49	34	75	22	100	16	127	6		
25	23	50	34	76	20	101	9	128	4		
26	13	51	24	77	13	102	8	129	4		
27	11	52	42	78	14	103	4	130	15		
28	17	53	42	79	27	104	2	131	14		
29	14	54	14	80	14	105	6	132	43		
30	18	55	30	81	9	106	4	133	26		
31	16	56	22	82	22	108	8	134	12		
32	23	57	30	83	9	109	15	135	8		

WING 6,F.R.TRIAXIAL TENSILE,STRAIN AT MAX STRESS,CPS=1750 IN/MIN,800 PSI

This sample size summary is applicable to figures 16 thru 20.

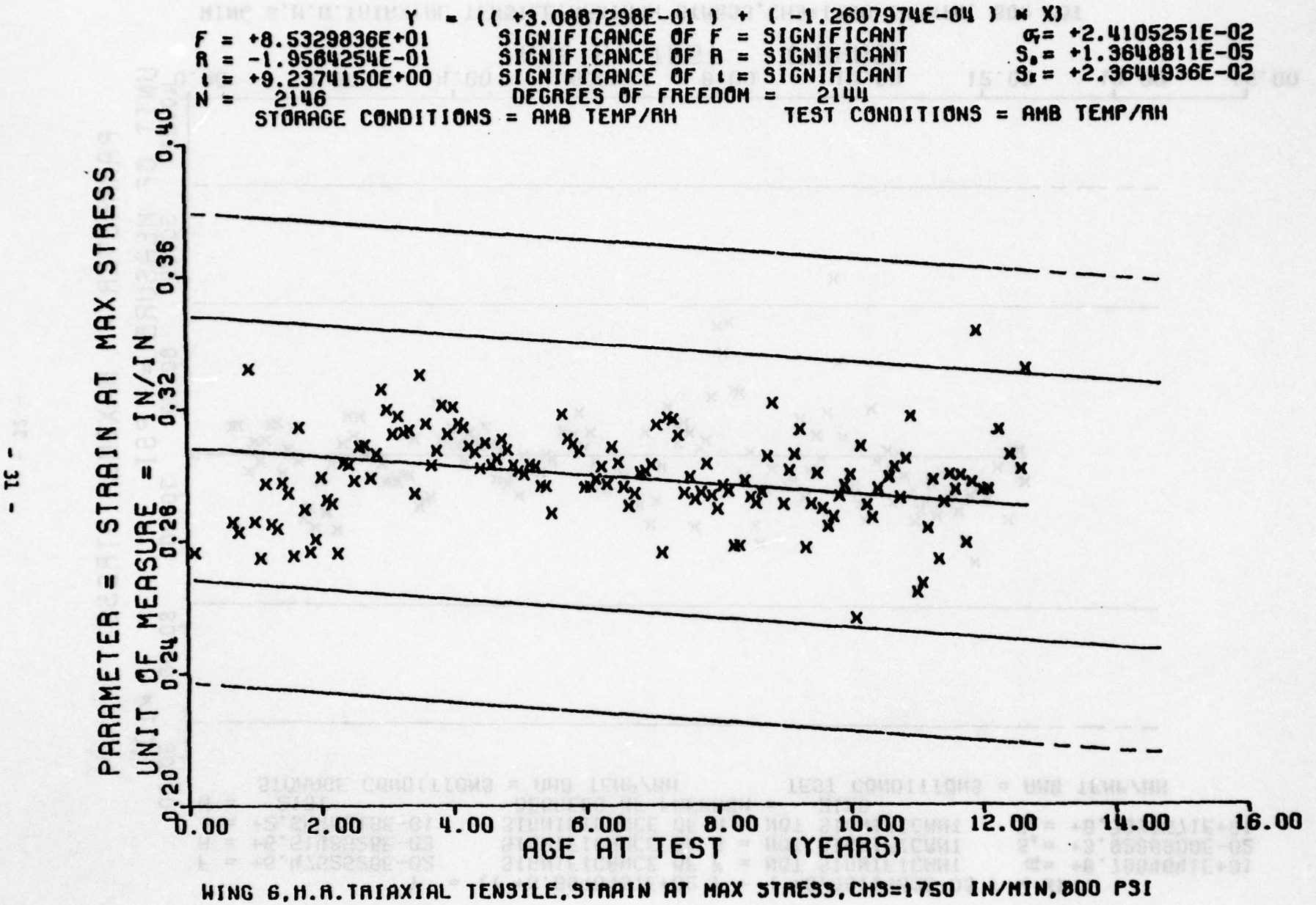

Y = ((+3.0887298E-01) + (-1.2607974E-04) * X)
F = +8.5329836E+01 SIGNIFICANCE OF F = SIGNIFICANT σr= +2.4105251E-02
R = -1.9564254E-01 SIGNIFICANCE OF R = SIGNIFICANT Sb= +1.3648811E-05
t = +9.2374150E+00 SIGNIFICANCE OF t = SIGNIFICANT St= +2.3644936E-02
N = 2146 DEGREES OF FREEDOM = 2144
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.40
0.36
0.32
0.28
0.24
0.20
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=1750 IN/MIN,800 PSI

Figure 16

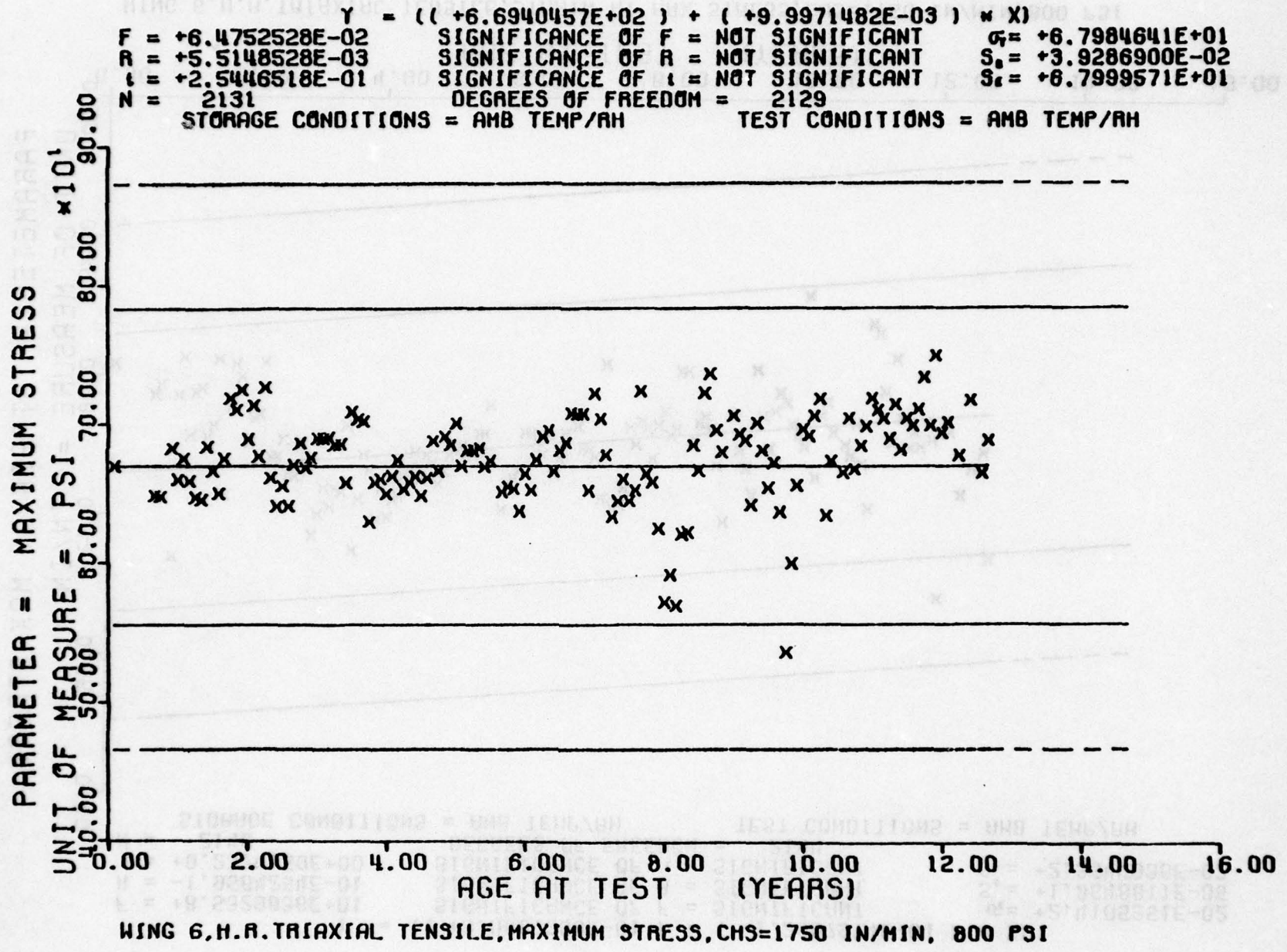

Y = ((+6.6940457E+02) + (+9.9971482E-03) * X)
F = +6.4752528E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT σT = +6.7984641E+01
R = +5.5148528E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT Se = +3.9286900E-02
t = +2.5446518E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT Sx = +6.7999571E+01
N = 2131 DEGREES OF FREEDOM = 2129
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI *10¹
90.00
80.00
70.00
60.00
50.00
40.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,MAXIMUM STRESS,CHS=1750 IN/MIN, 800 PSI

Figure 17

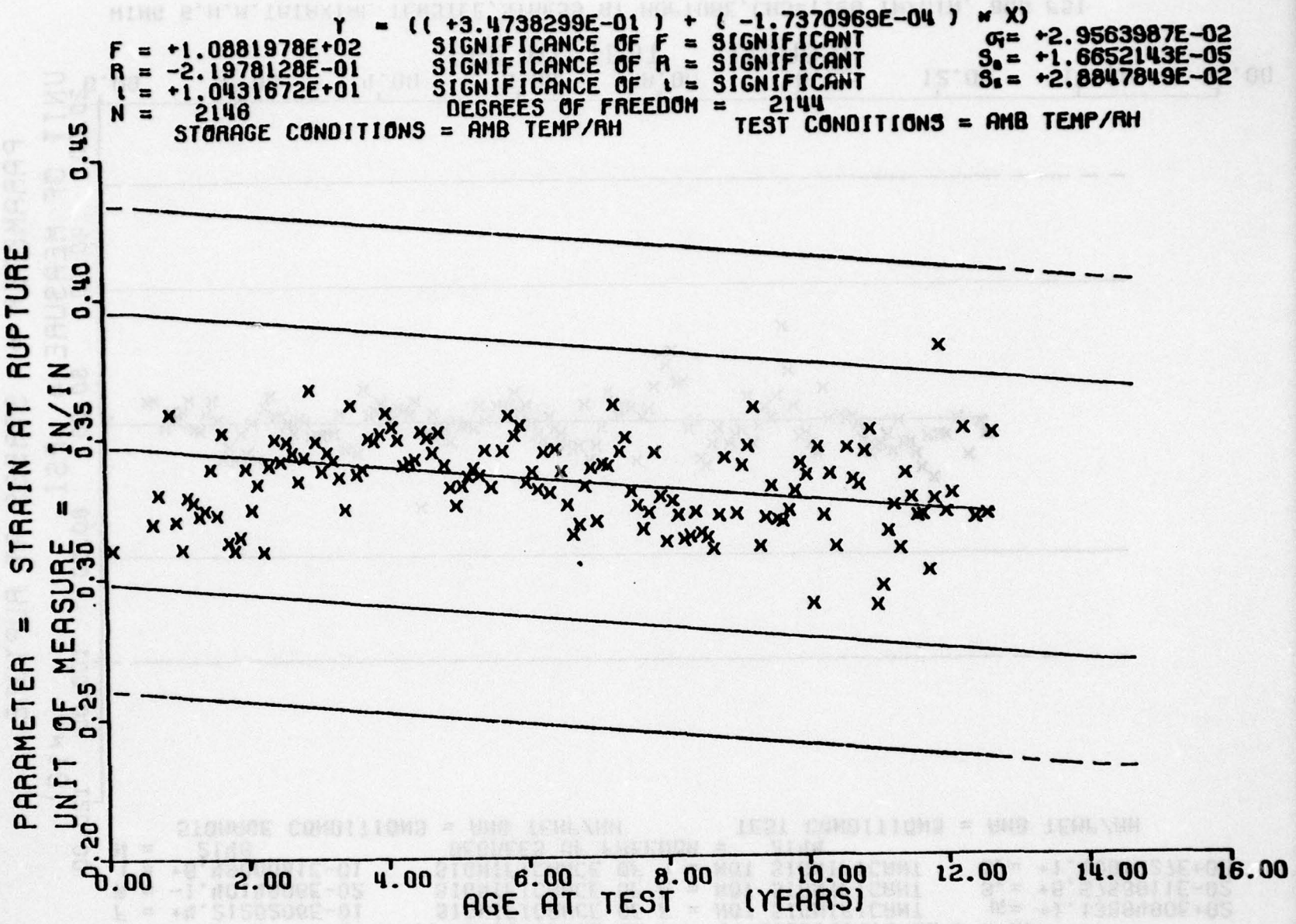

Y = ((+3.4738299E-01) + (-1.7370969E-04) * X)
F = +1.0881978E+02
R = -2.1978128E-01
t = +1.0431672E+01
N = 2146
SIGNIFICANCE OF F = SIGNIFICANT
SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF t = SIGNIFICANT
DEGREES OF FREEDOM = 2144
σ = +2.9563987E-02
S = +1.6652143E-05
S = +2.8847849E-02
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.45
0.40
0.35
0.30
0.25
0.20
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,STRAIN AT RUPTURE,CHS=1750 IN/MIN, 800 PSI

Figure 18

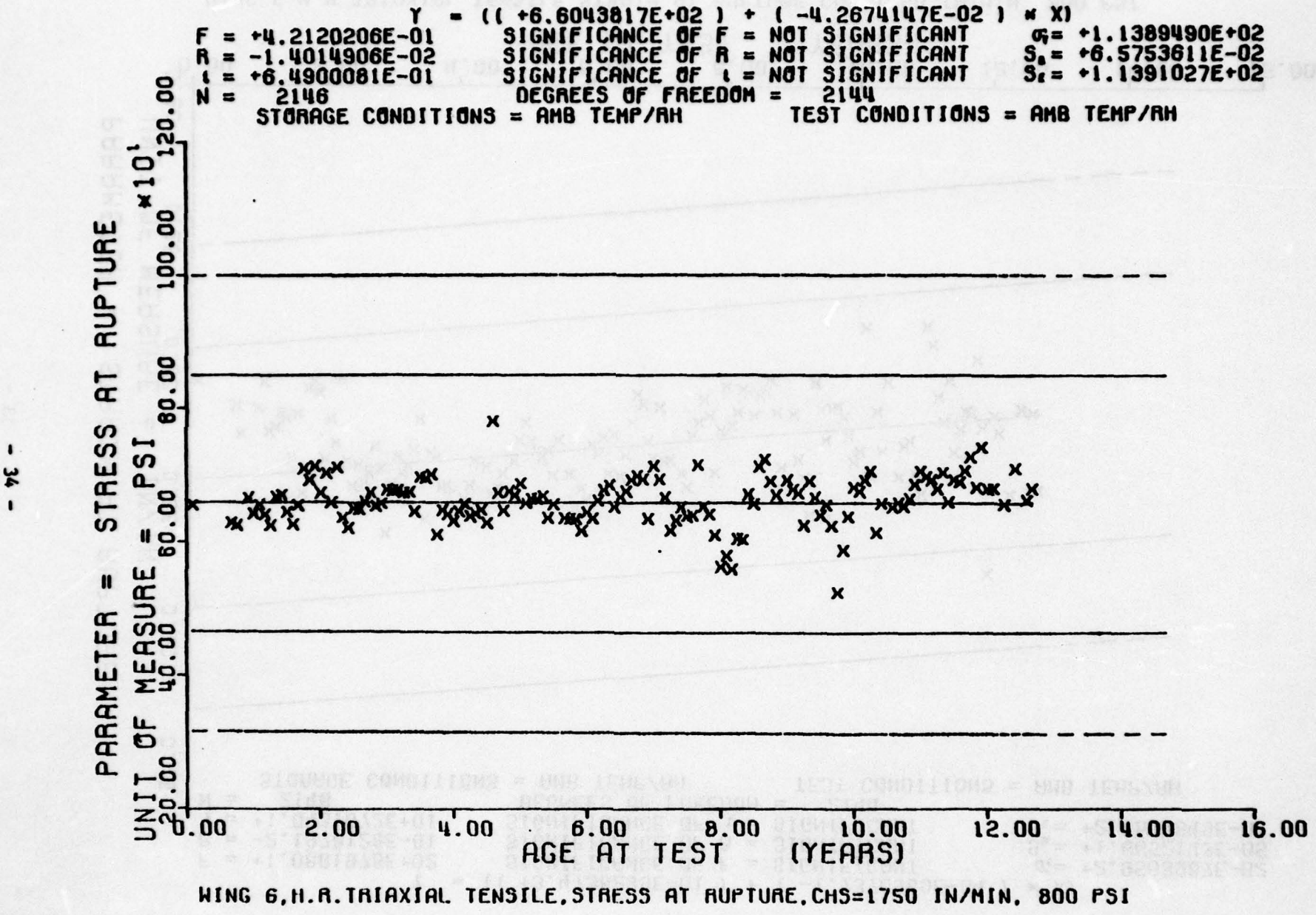
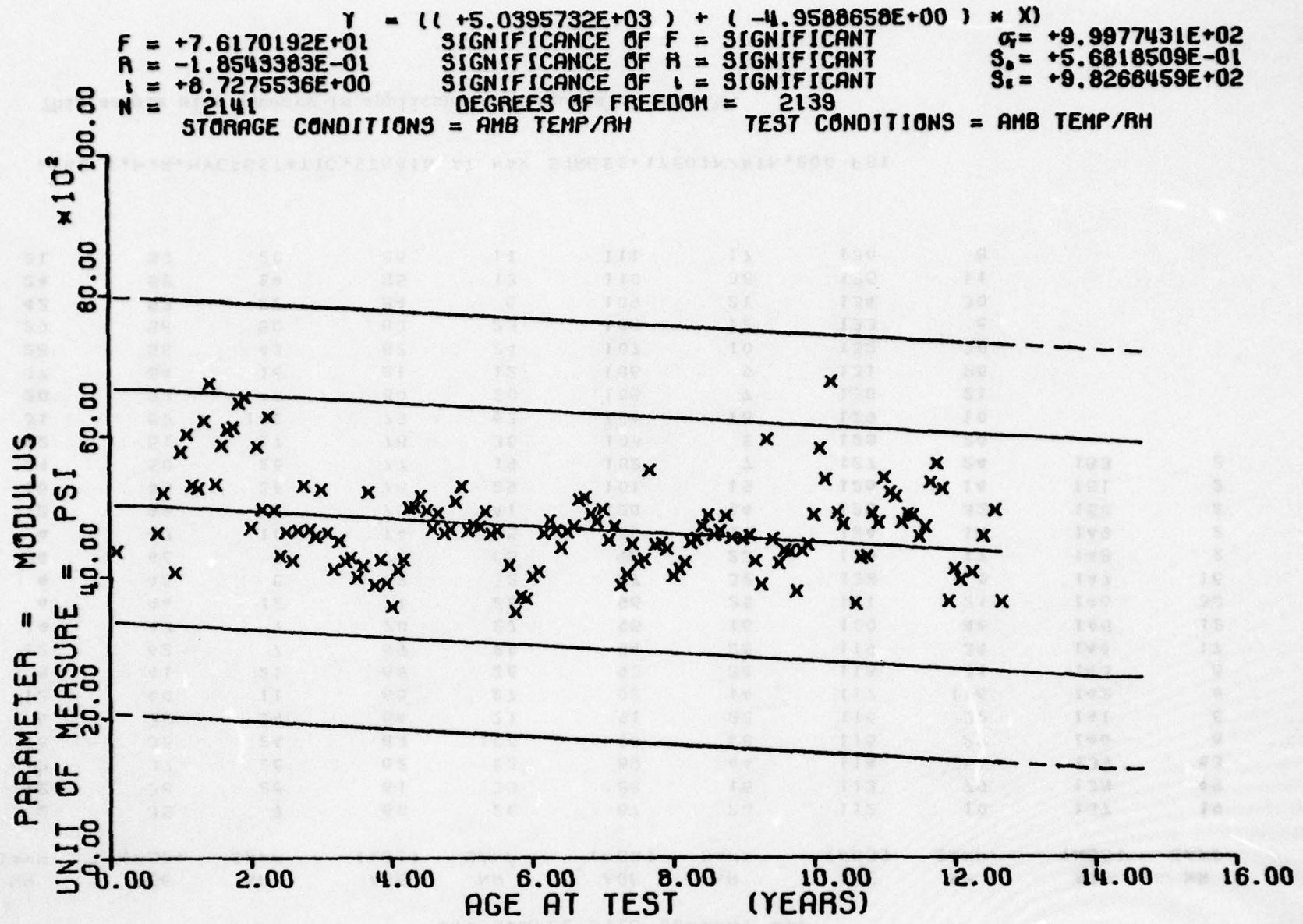

Y = ((+6.6043817E+02) + (-4.2674147E-02) * X)
F = +4.2120206E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ = +1.1389490E+02
R = -1.4014906E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S = +6.5753611E-02
ι = +6.4900081E-01 SIGNIFICANCE OF ι = NOT SIGNIFICANT S = +1.1391027E+02
N = 2146 DEGREES OF FREEDOM = 2144
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI *10¹
120.00
100.00
80.00
60.00
40.00
20.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,STRESS AT RUPTURE,CHS=1750 IN/MIN, 800 PSI

Figure 19



WING 6,H.R.TRIAXIAL TENSILE,MODULUS,CHS=1750 IN/MIN AT 800 PSI

Figure 20

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
9	2	35	7	60	26	87	23	112	10	137	19
11	12	36	26	61	33	88	15	113	79	138	49
12	12	37	26	62	52	89	44	114	51	139	63
13	18	38	24	63	100	90	48	115	27	140	6
14	4	39	34	64	31	91	23	116	32	141	8
15	12	40	11	65	27	92	14	117	116	142	8
16	8	41	21	68	26	93	28	118	31	143	6
17	12	42	7	69	29	94	26	119	34	144	17
18	14	43	7	70	27	95	16	120	46	145	12
19	4	44	12	71	26	96	25	121	21	146	30
20	4	45	5	72	32	97	32	122	6	147	16
21	24	46	9	73	65	98	23	123	17	148	2
22	4	47	10	74	45	99	17	124	14	149	2
23	2	48	4	75	41	100	14	125	32	150	2
24	16	49	28	76	29	101	19	126	14	151	2
25	24	50	26	77	19	102	7	127	24	153	2
26	12	51	57	78	30	103	5	128	26		
27	31	52	100	79	63	104	16	129	10		
28	20	53	49	80	20	105	7	130	21		
29	37	54	16	81	12	106	9	131	26		
30	28	55	43	82	24	107	10	132	30		
31	29	56	50	83	23	108	12	133	6		
32	42	57	52	84	6	109	21	134	30		
33	24	58	54	85	13	110	36	135	11		
34	21	59	20	86	11	111	17	136	8		

WING 6,F.R.HYDROSTATIC,STRAIN AT MAX STRESS,1750IN/MIN,600 PSI

This sample size summary is applicable to figures 21 thru 25.

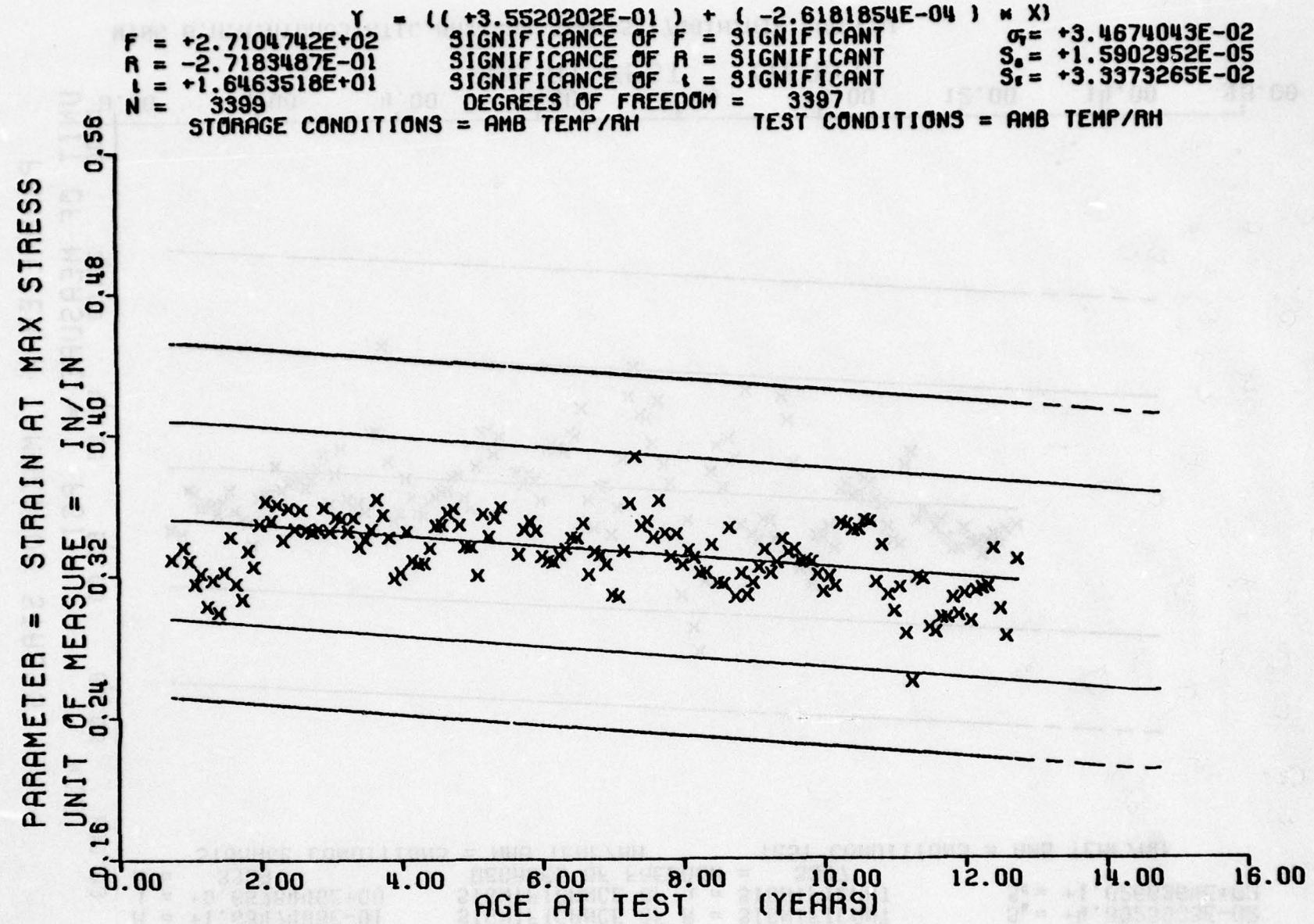

Y = ((+3.5520202E-01) + (-2.6181854E-04) * X)
F = +2.7104742E+02
R = -2.7183487E-01
t = +1.6463518E+01
N = 3399
SIGNIFICANCE OF F = SIGNIFICANT
SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF t = SIGNIFICANT
DEGREES OF FREEDOM = 3397
σ = +3.4674043E-02
S = +1.5902952E-05
S = +3.3373265E-02
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.16
0.24
0.32
0.40
0.48
0.56
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,STRAIN AT MAX STRESS,1750IN/MIN,800 PSI

Figure 21

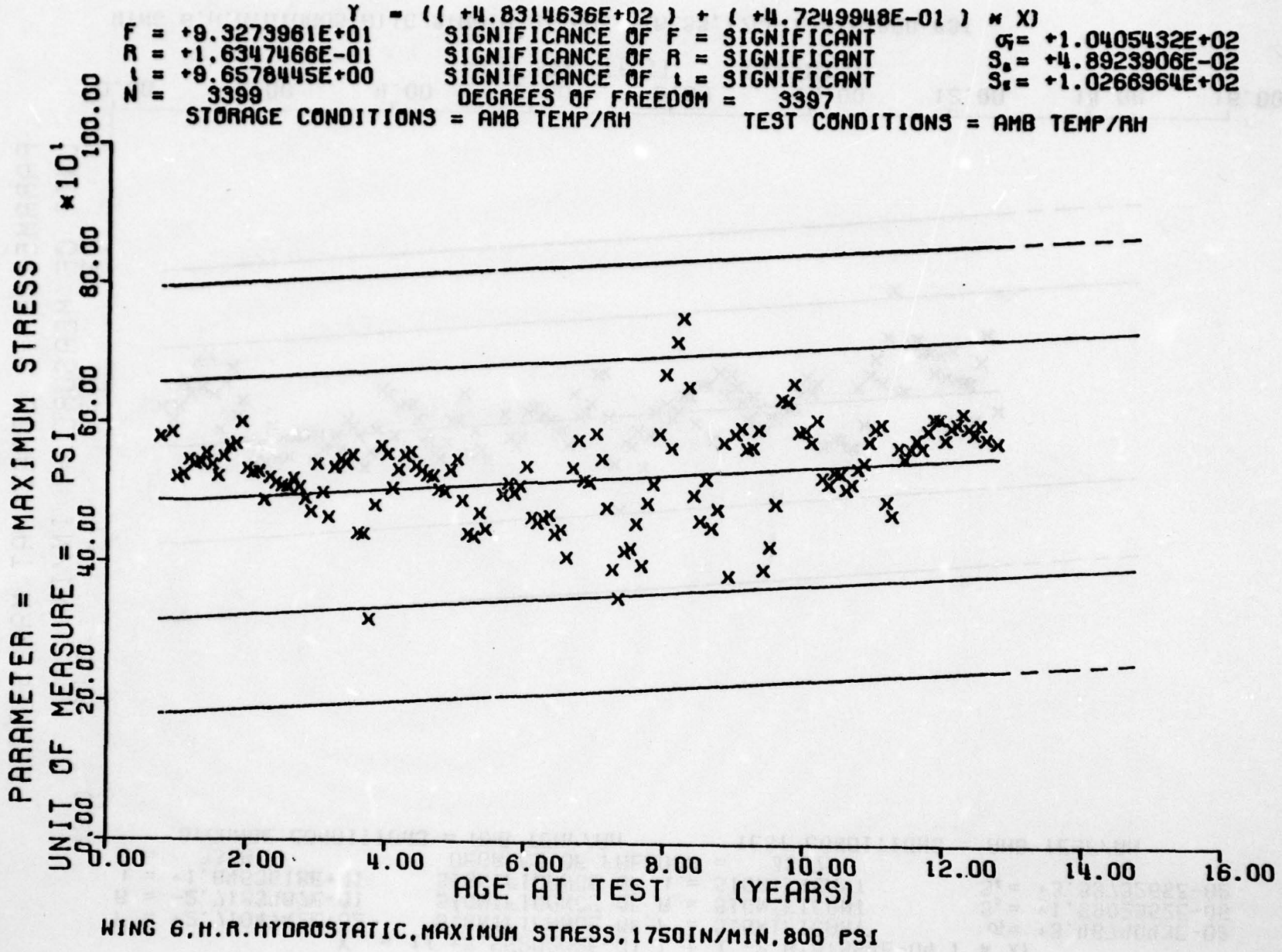
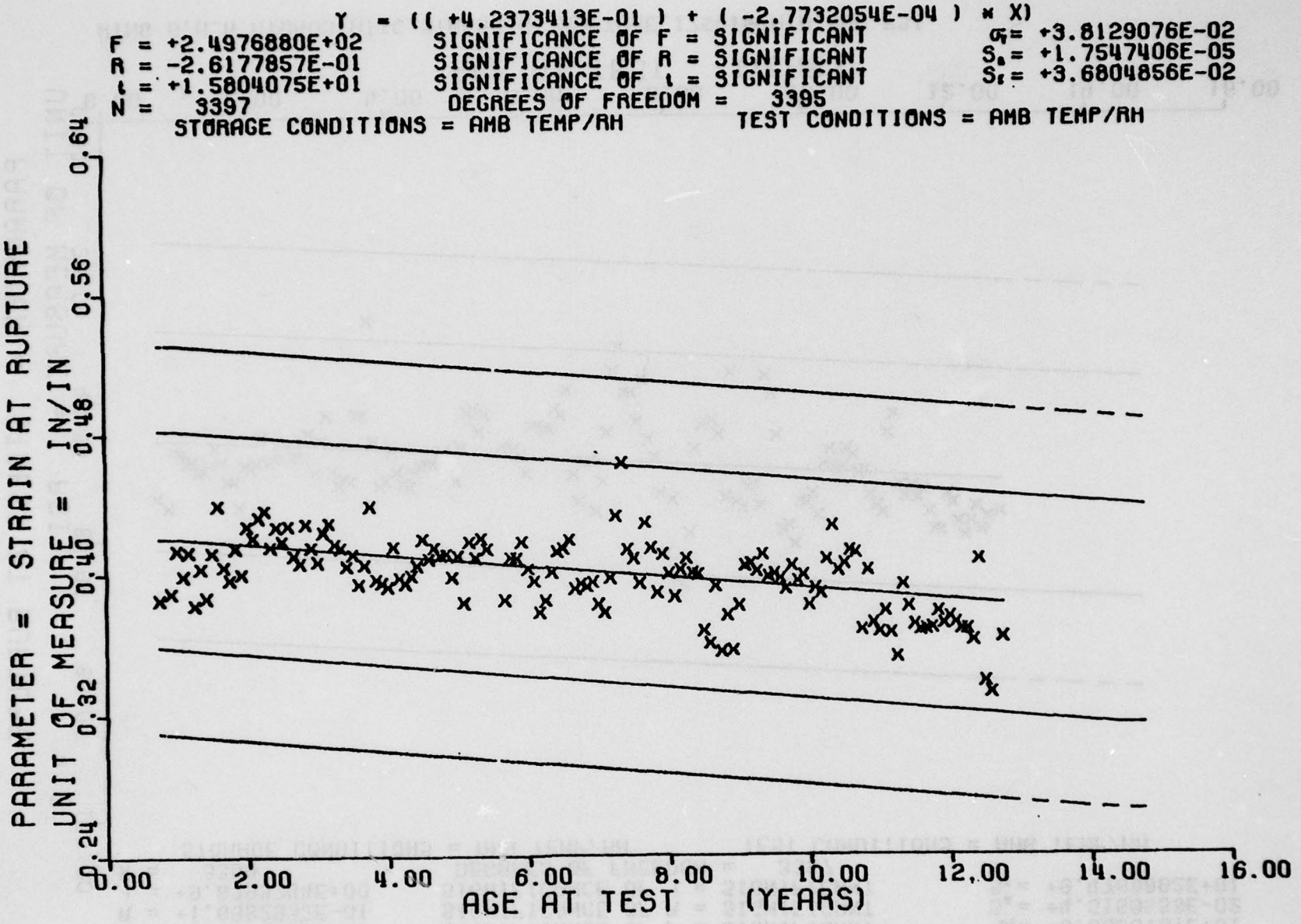

Y = ((+4.8314636E+02) + (+4.7249948E-01) * X)
F = +9.3273961E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = +1.6347466E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +9.6578445E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 3399 DEGREES OF FREEDOM = 3397
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
σ = +1.0405432E+02
S = +4.8923906E-02
S = +1.0266964E+02
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI *10¹
100.00
80.00
60.00
40.00
20.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,MAXIMUM STRESS,1750IN/MIN,800 PSI

Figure 22



WING 6,M.R.HYDROSTATIC,STRAIN AT RUPTURE,1750IN/MIN,800 PSI

Figure 23

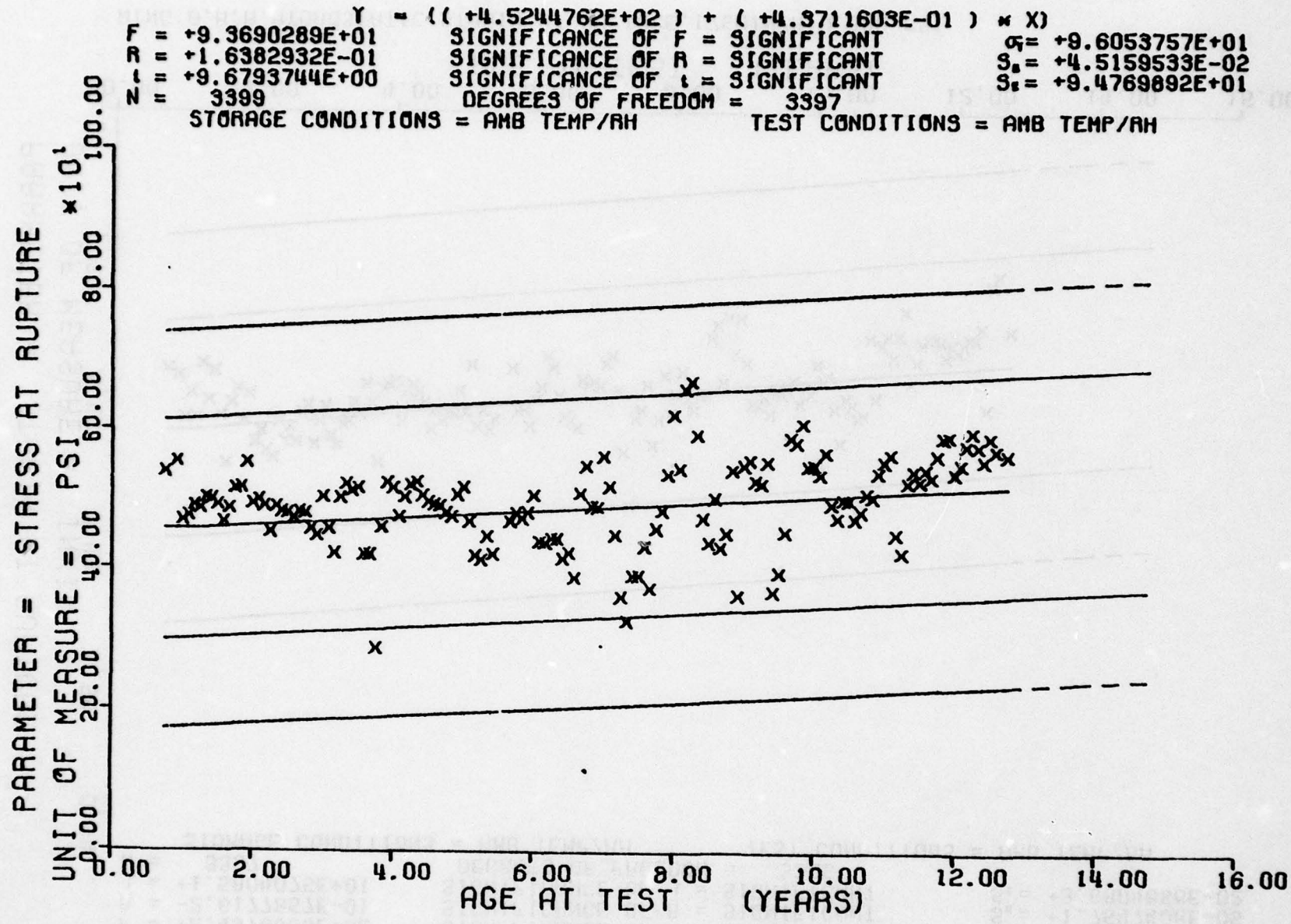

Y = ((+4.5244762E+02) + (+4.3711603E-01) * X)
F = +9.3690289E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +9.6053757E+01
R = +1.6382932E-01 SIGNIFICANCE OF R = SIGNIFICANT S_a = +4.5159533E-02
t = +9.6793744E+00 SIGNIFICANCE OF t = SIGNIFICANT S_t = +9.4769892E+01
N = 3399 DEGREES OF FREEDOM = 3397
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI *10^1
100.00
80.00
60.00
40.00
20.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,STRESS AT RUPTURE,1750IN/MIN,800 PSI

Figure 24

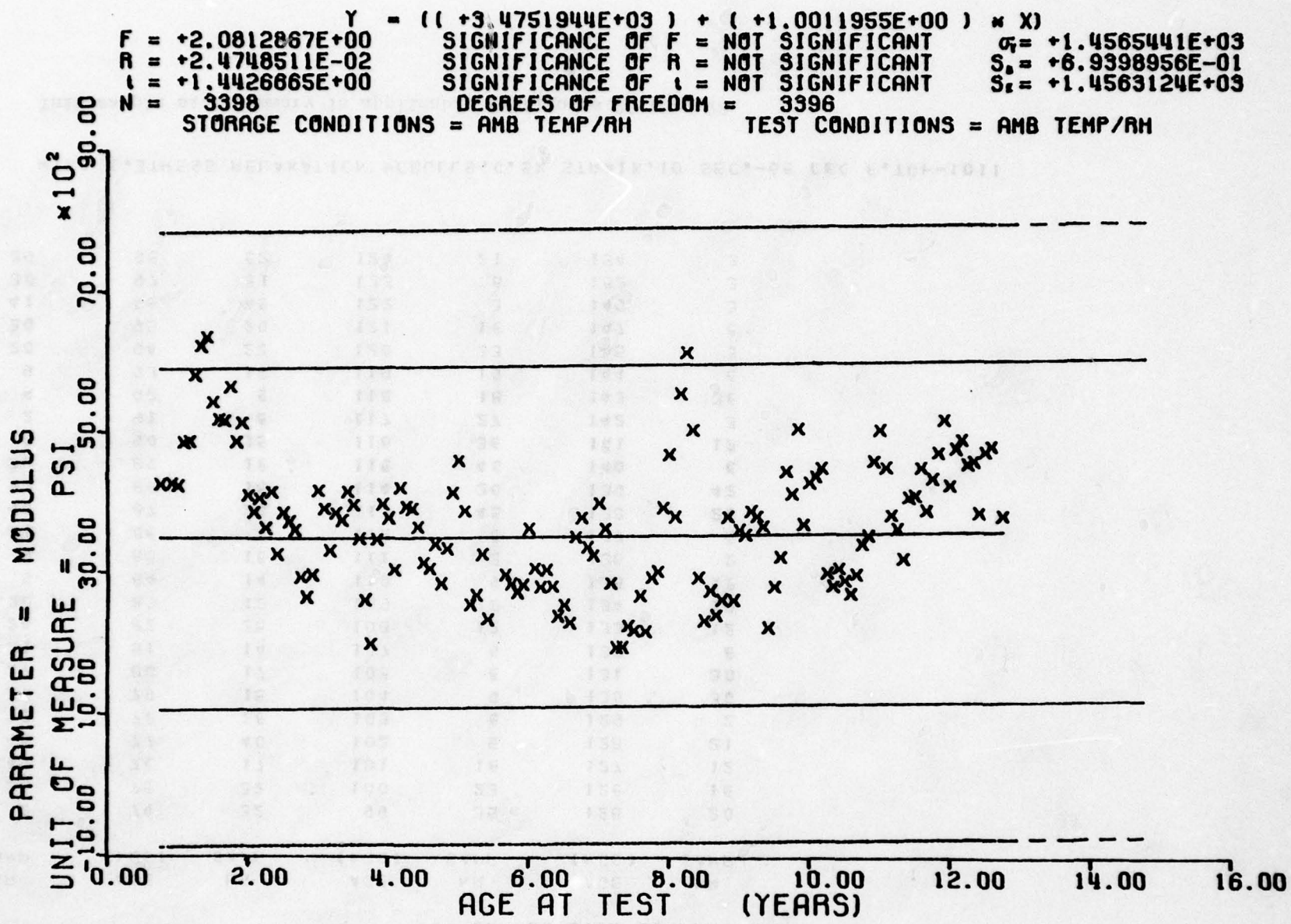

Y = ((+3.4751944E+03) + (+1.0011955E+00) * X)
F = +2.0812867E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σr= +1.4565441E+03
R = +2.4748511E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT Sb= +6.9398956E-01
t = +1.4426865E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT Sr= +1.4563124E+03
N = 3398 DEGREES OF FREEDOM = 3396
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI x10²
90.00
70.00
50.00
30.00
10.00
-10.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,MODULUS,1750 IN/MIN, 800 PSI

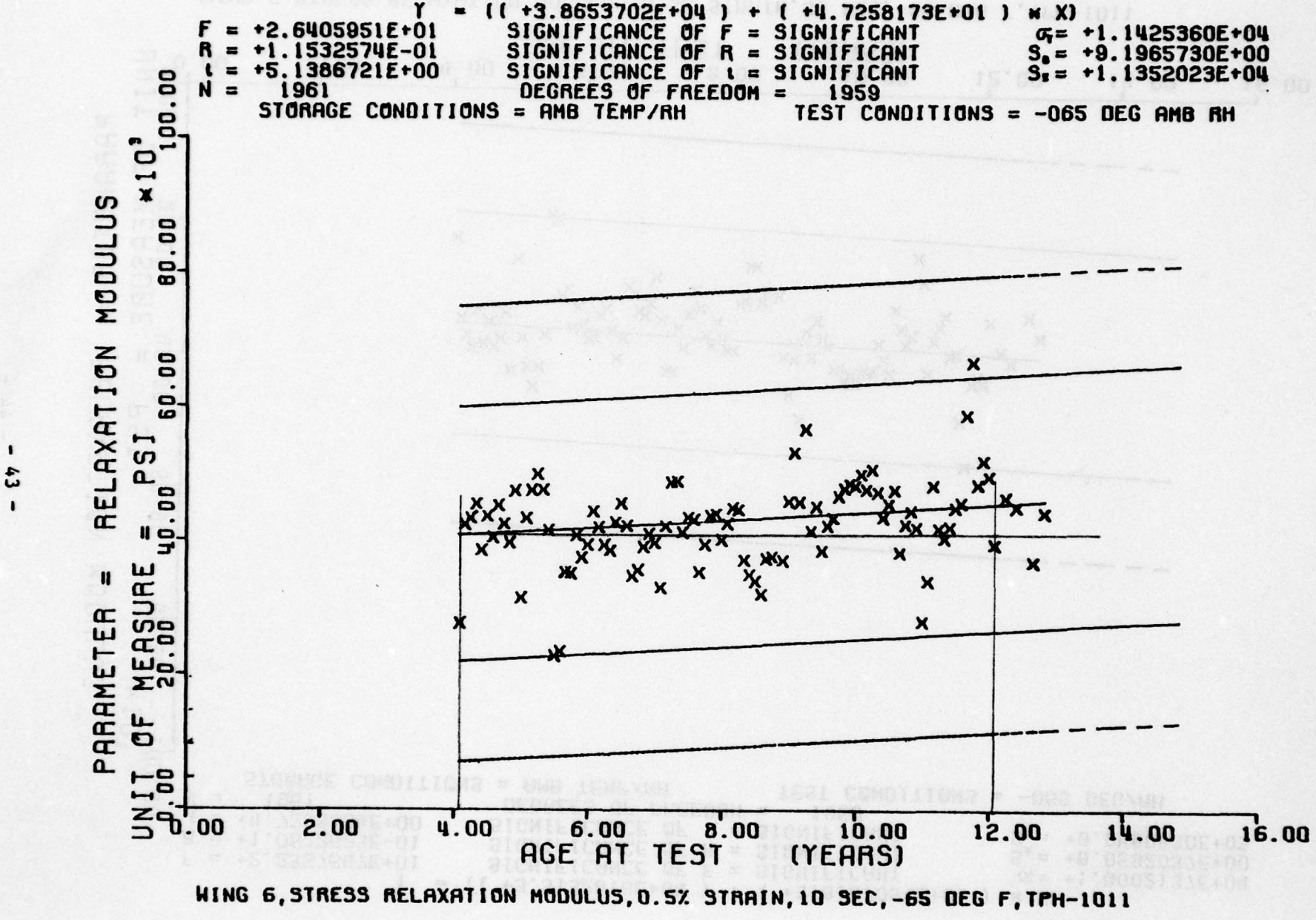
Figure 25

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
49	2	74	32	99	35	125	20
50	26	75	32	100	23	126	16
51	45	76	17	101	18	127	12
52	46	77	40	102	5	128	21
53	18	78	28	103	6	129	2
54	27	79	15	104	9	130	30
55	27	80	17	105	6	131	30
56	21	81	14	107	5	132	8
57	24	82	35	108	12	133	12
58	20	83	12	109	12	134	19
59	5	84	14	110	5	135	15
60	9	85	15	111	3	136	2
61	21	86	6	112	8	137	6
62	46	87	24	113	45	138	28
63	23	88	16	114	30	139	42
64	30	89	18	115	40	140	6
65	5	90	15	116	36	141	12
66	2	91	8	117	27	142	3
67	5	92	5	118	18	143	36
68	9	93	19	119	19	144	6
69	20	94	23	120	33	145	3
70	30	95	20	121	18	147	6
71	41	96	45	122	3	149	3
72	30	97	51	123	6	152	3
73	39	98	52	124	21	154	3

WING C,STRESS RELAXATION MCCULLS,0.5% STRAIN,10 SEC,-65 DEG F,TPH-1011

This sample size summary is applicable to figures 26 thru 29.



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC, -65 DEG F, TPH-1011

Figure 26

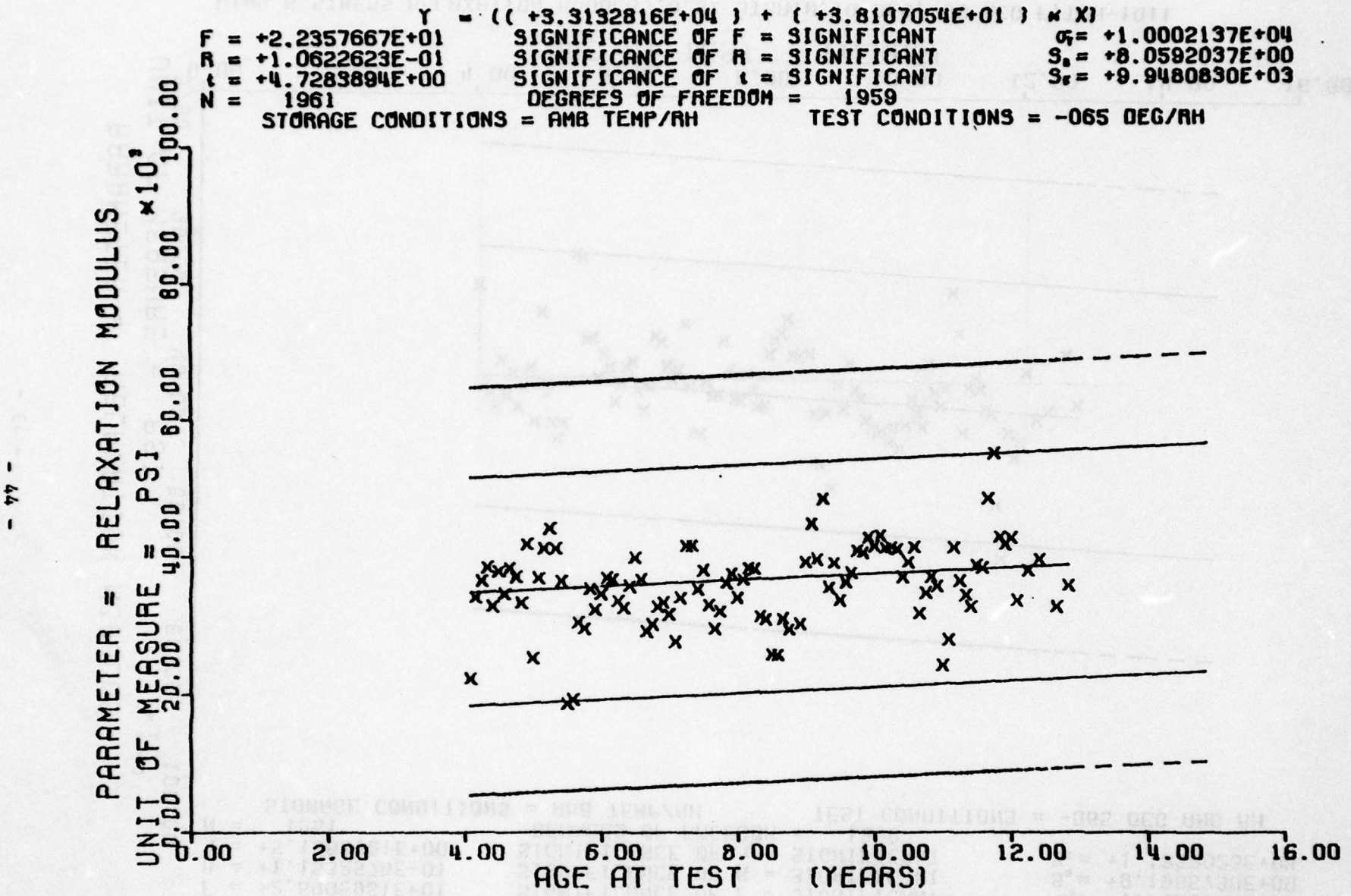

Y = ((+3.3132816E+04) + (+3.8107054E+01) * X)
F = +2.2357667E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +1.0002137E+04
R = +1.0622623E-01 SIGNIFICANCE OF R = SIGNIFICANT S_a = +8.0592037E+00
t = +4.7283894E+00 SIGNIFICANCE OF t = SIGNIFICANT S_ε = +9.9480830E+03
N = 1961 DEGREES OF FREEDOM = 1959
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10³
0.00
20.00
40.00
60.00
80.00
100.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,50 SEC,-65 DEG F,TPH-1011

Figure 27

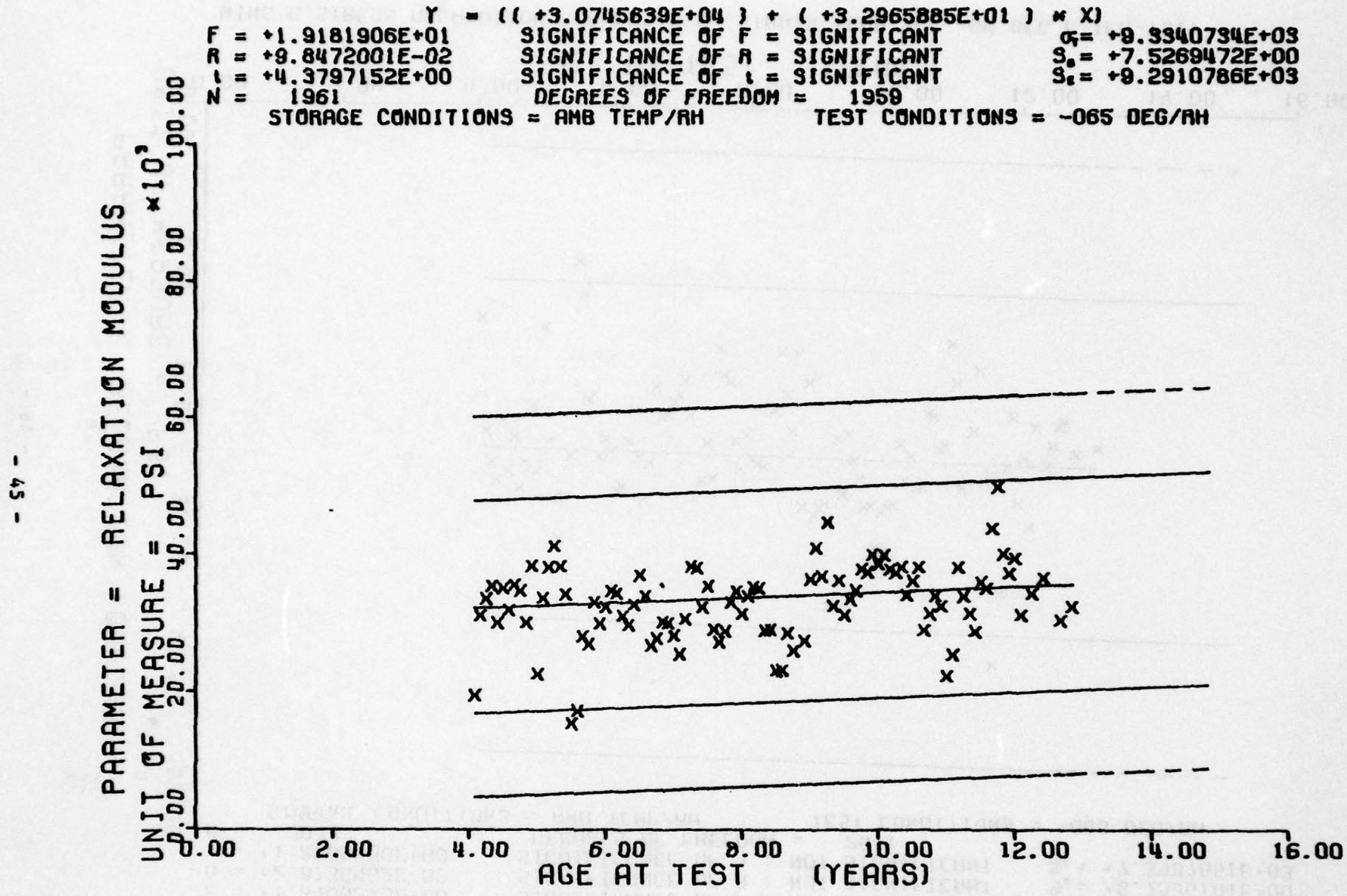

Y = ((+3.0745639E+04) + (+3.2965885E+01) * X)
F = +1.9181906E+01 SIGNIFICANCE OF F = SIGNIFICANT σt= +9.3340734E+03
R = +9.8472001E-02 SIGNIFICANCE OF R = SIGNIFICANT Se= +7.5269472E+00
t = +4.3797152E+00 SIGNIFICANCE OF t = SIGNIFICANT St= +9.2910786E+03
N = 1961 DEGREES OF FREEDOM = 1959
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10³
0.00
20.00
40.00
60.00
80.00
100.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,100 SEC,-65 DEG F,TPH-1011

Figure 28

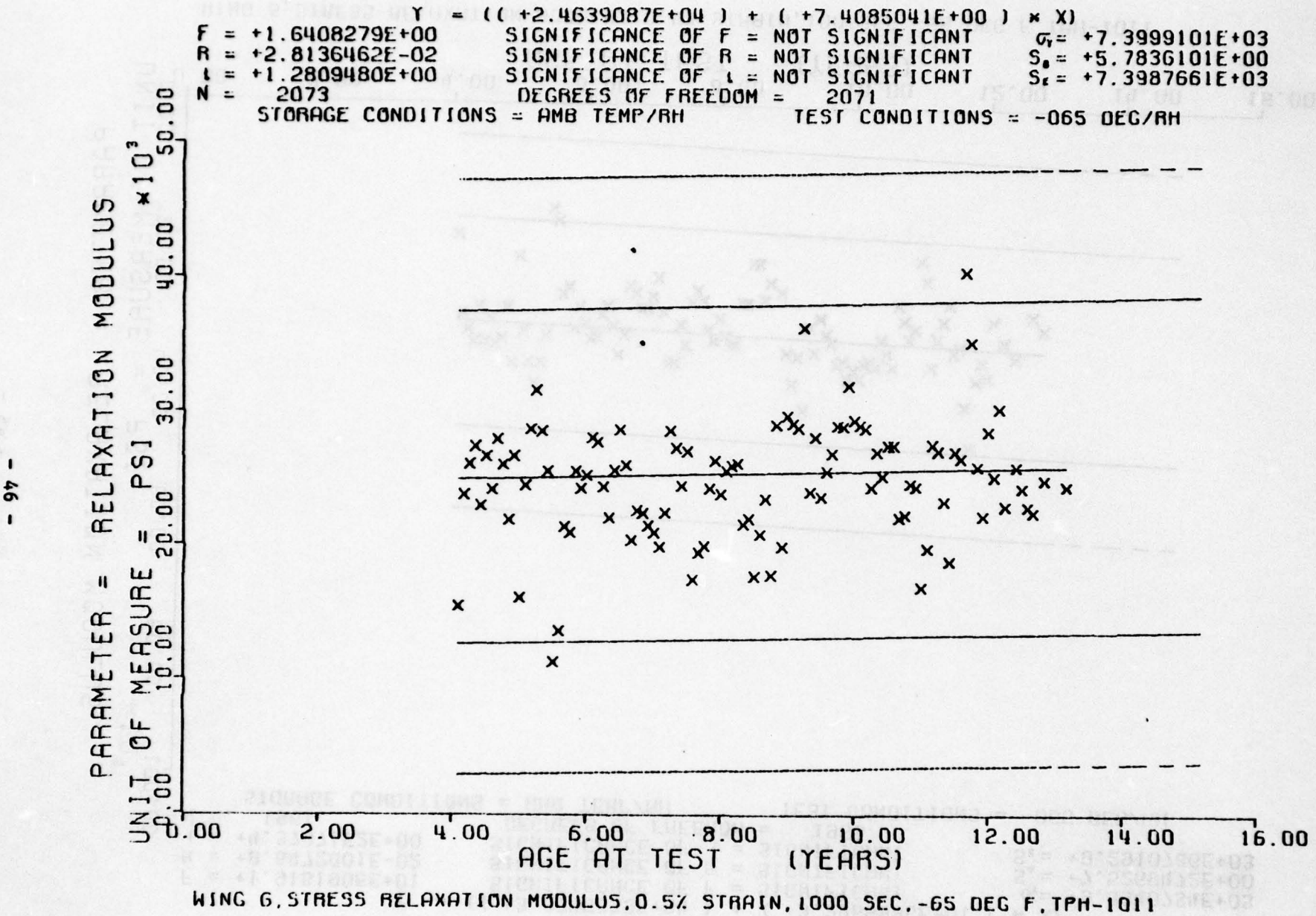

Y = ((+2.4639087E+04) + (+7.4085041E+00) * X)
F = +1.6408279E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ = +7.3999101E+03
R = +2.8136462E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S = +5.7836101E+00
t = +1.2809480E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S = +7.3987661E+03
N = 2073 DEGREES OF FREEDOM = 2071
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10³
0.00
10.00
20.00
30.00
40.00
50.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,1000 SEC,-65 DEG F,TPH-1011

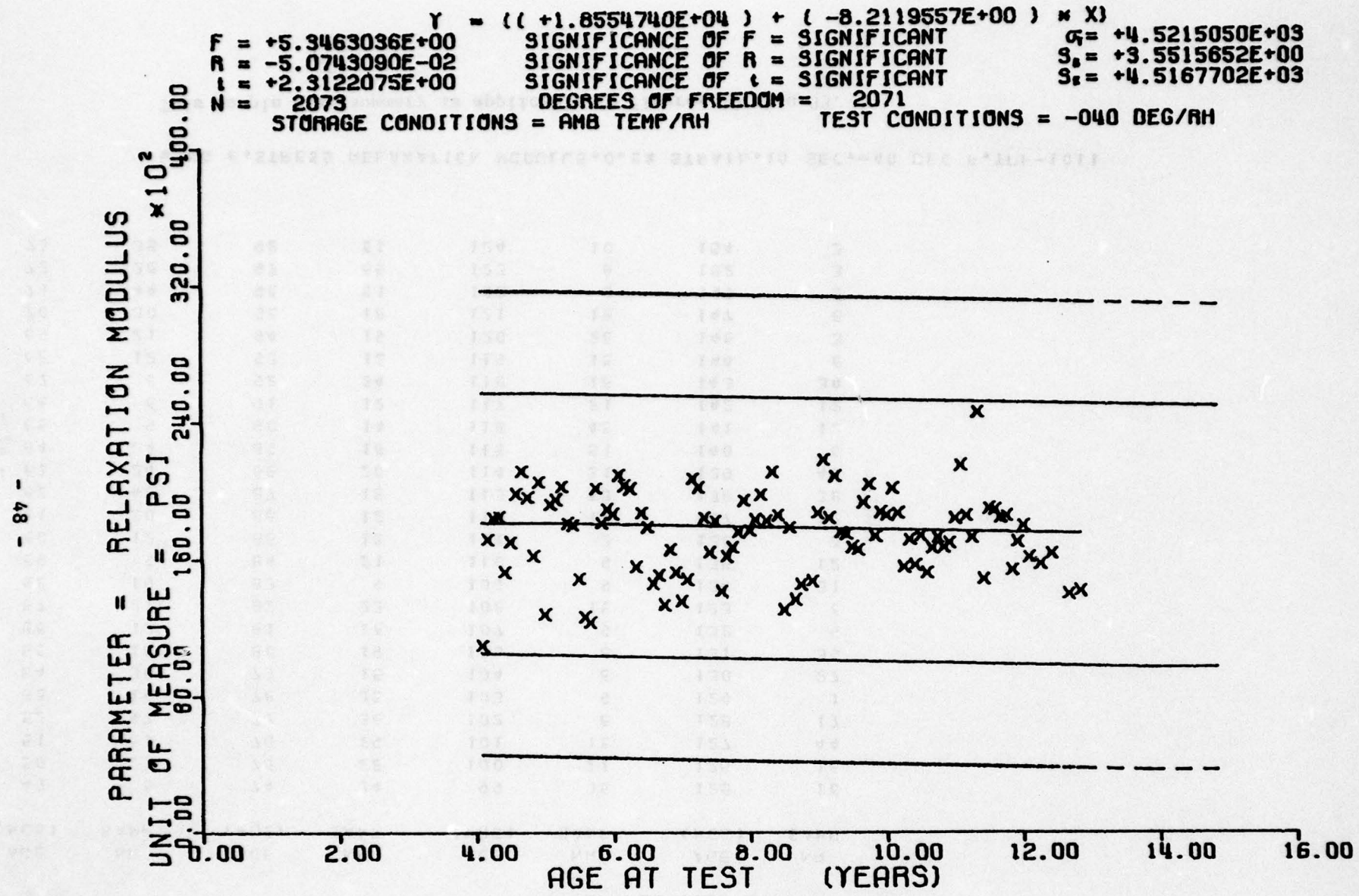
Figure 29

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
49	6	74	34	99	36	125	16
50	27	75	28	100	21	126	16
51	51	76	29	101	15	127	44
52	47	77	36	102	6	128	17
53	14	78	35	103	9	129	1
54	30	79	15	104	6	130	27
55	18	80	19	105	6	131	39
56	12	81	16	107	9	132	9
57	27	82	33	108	15	133	6
58	19	83	9	109	9	134	31
59	9	84	21	110	9	135	12
60	12	85	15	111	3	136	3
61	20	86	12	112	12	137	12
62	48	87	18	113	53	138	38
63	24	88	20	114	31	139	48
64	24	89	18	115	51	140	6
65	9	90	14	116	43	141	12
66	6	91	12	117	21	142	12
67	6	92	24	118	18	143	34
68	12	93	12	119	15	144	6
69	21	94	19	120	26	145	3
70	30	95	18	121	18	147	6
71	44	96	51	122	3	149	3
72	36	97	65	123	8	152	3
73	35	98	51	124	10	154	3

WING 6,STRESS RELAXATION MCCULLS,0.5% STRAIN,10 SEC,-40 DEG F,TPH-1011

This sample size summary is applicable to figures 30 thru 33.



WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,10 SEC,-40 DEG F,TPH-1011

Figure 30

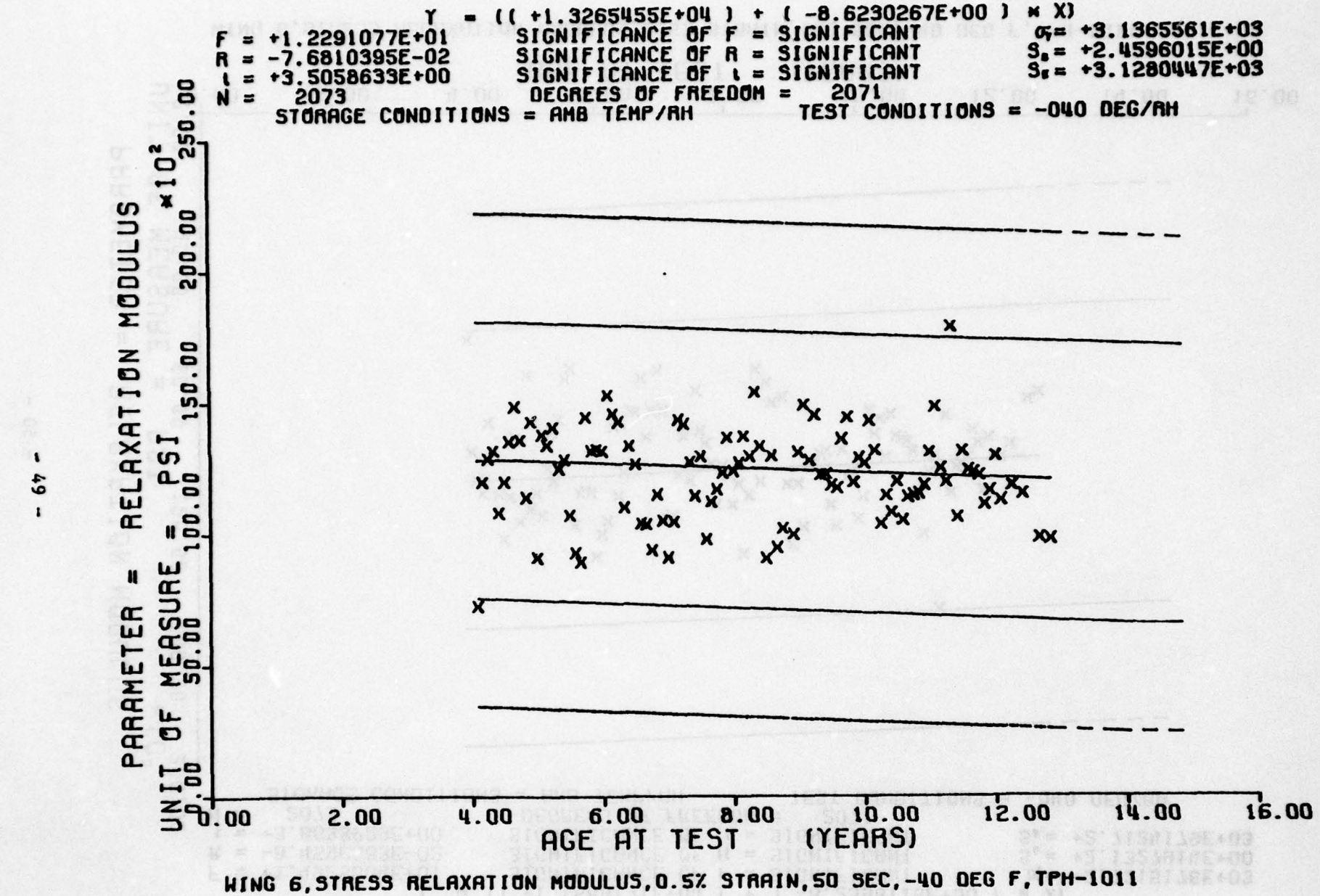

Y = ((+1.3265455E+04) + (-8.6230267E+00) * X)
F = +1.2291077E+01
SIGNIFICANCE OF F = SIGNIFICANT
σY= +3.1365561E+03
R = -7.6810395E-02
SIGNIFICANCE OF R = SIGNIFICANT
Sa= +2.4596015E+00
t = +3.5058633E+00
SIGNIFICANCE OF t = SIGNIFICANT
Sx= +3.1280447E+03
N = 2073
DEGREES OF FREEDOM = 2071
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = -040 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10²
0.00
50.00
100.00
150.00
200.00
250.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,50 SEC,-40 DEG F,TPH-1011

Figure 31

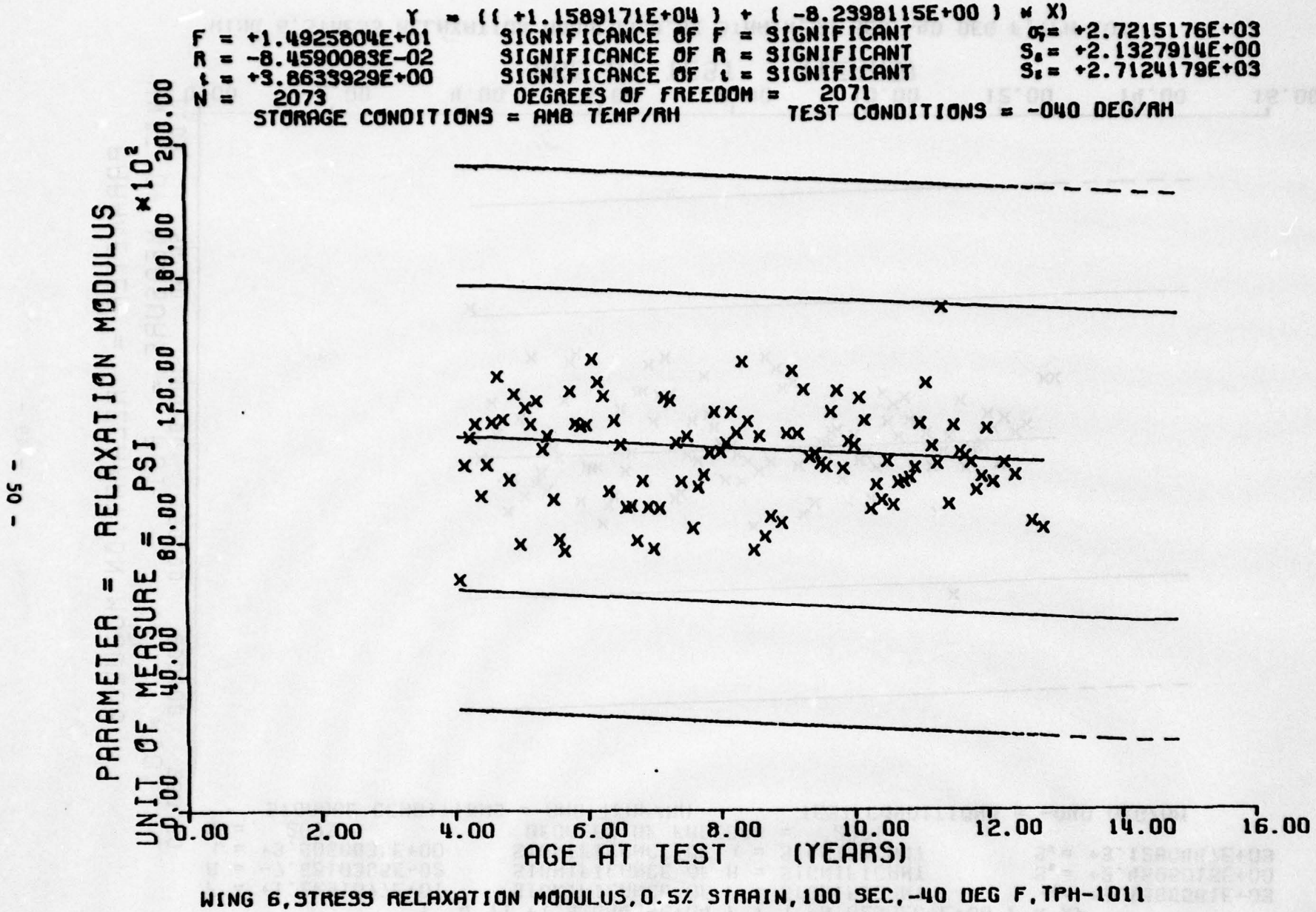
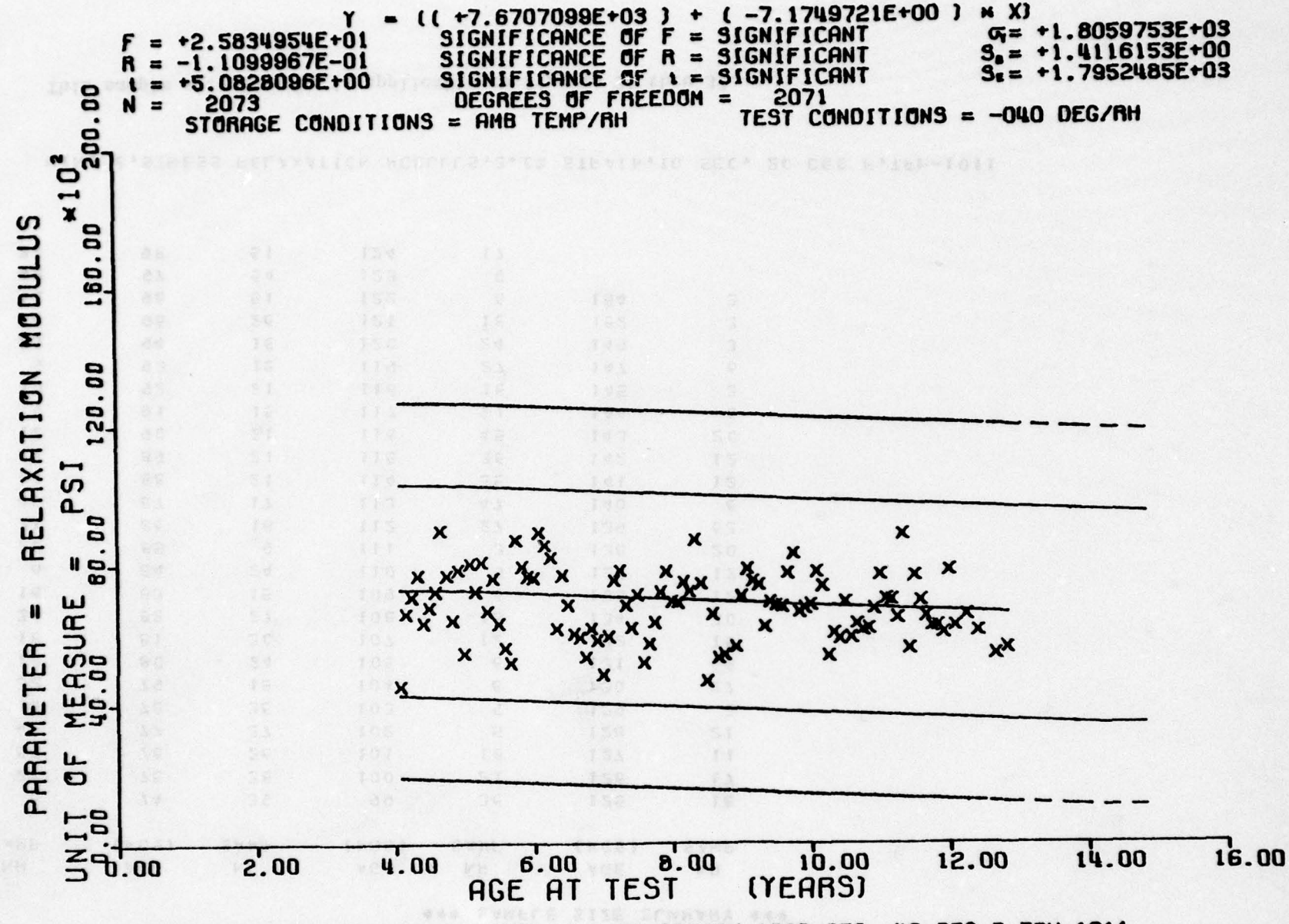

Y = ((+1.1589171E+04) + (-8.2398115E+00) * X)
F = +1.4925804E+01
SIGNIFICANCE OF F = SIGNIFICANT
σ = +2.7215176E+03
R = -8.4590083E-02
SIGNIFICANCE OF R = SIGNIFICANT
S = +2.1327914E+00
t = +3.8633929E+00
SIGNIFICANCE OF t = SIGNIFICANT
S = +2.7124179E+03
N = 2073
DEGREES OF FREEDOM = 2071
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = -040 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10²
0.00
40.00
80.00
120.00
160.00
200.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,100 SEC,-40 DEG F,TPH-1011

Figure 32



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC, -40 DEG F, TPH-1011

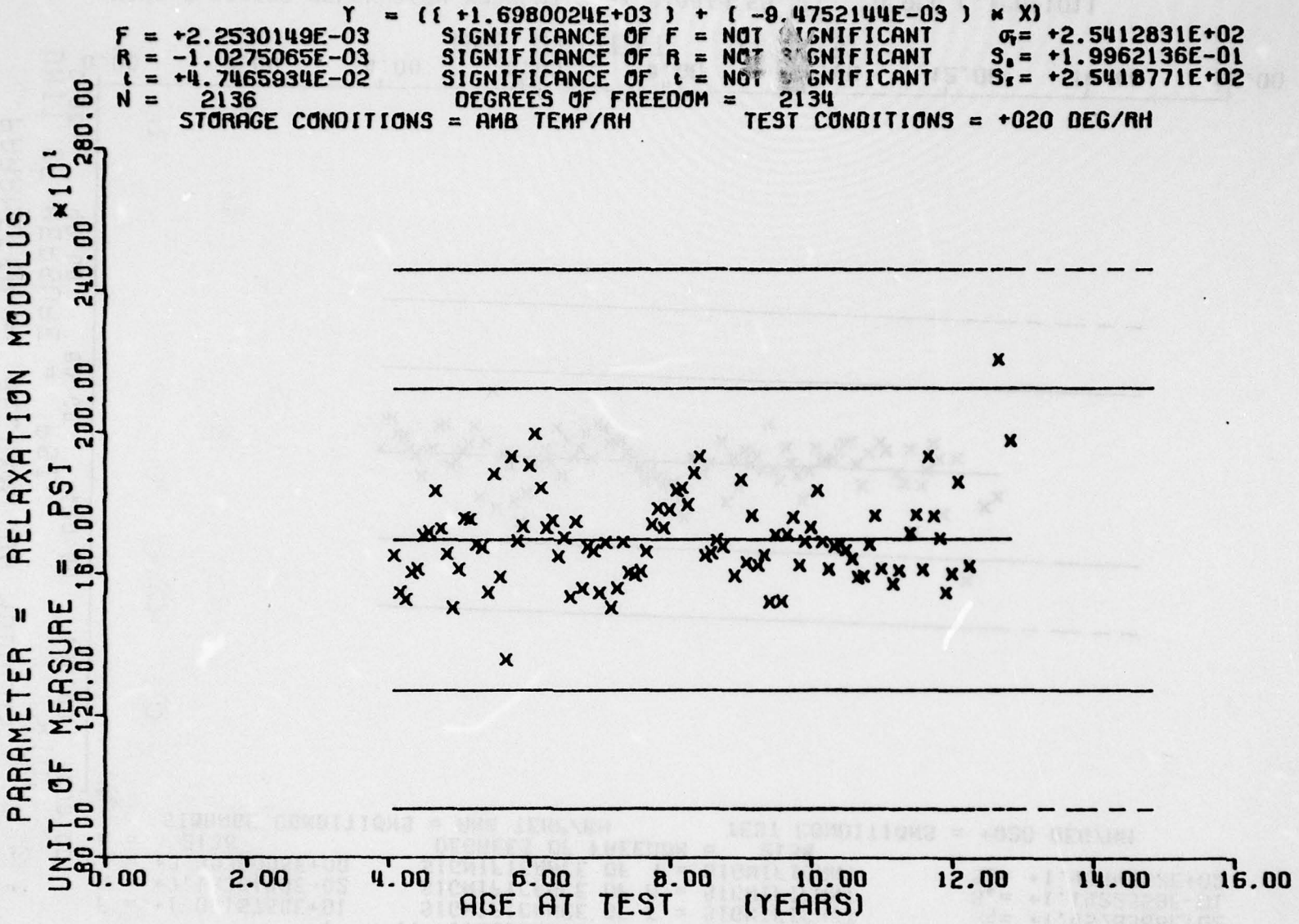
Figure 33

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
49	6	74	35	99	36	125	18
50	27	75	38	100	21	126	17
51	55	76	26	101	18	127	11
52	48	77	37	102	5	128	21
53	15	78	36	103	5	129	3
54	32	79	18	104	6	130	27
55	18	80	24	105	6	131	42
56	18	81	30	107	12	132	15
57	30	82	27	108	15	134	30
58	16	83	15	109	6	135	12
59	6	84	24	110	5	137	12
60	22	85	5	111	3	138	20
61	21	86	18	112	27	139	63
62	45	87	17	113	47	140	6
63	24	88	21	114	35	141	12
64	27	89	21	115	36	142	12
65	12	90	21	116	45	143	20
66	5	91	15	117	21	144	6
67	10	92	21	118	15	145	3
68	5	93	15	119	27	147	6
69	29	94	18	120	24	149	3
70	24	95	26	121	18	152	3
71	46	96	51	122	6	154	3
72	42	97	54	123	5		
73	24	98	51	124	17		

WING 6,STRESS RELAXATION MCCULLS,3.0% STRAIN,10 SEC, 20 DEG F,TPH-1011

This sample size summary is applicable to figures 34 thru 37.



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC, 20 DEG F,TPH-1011

Figure 34

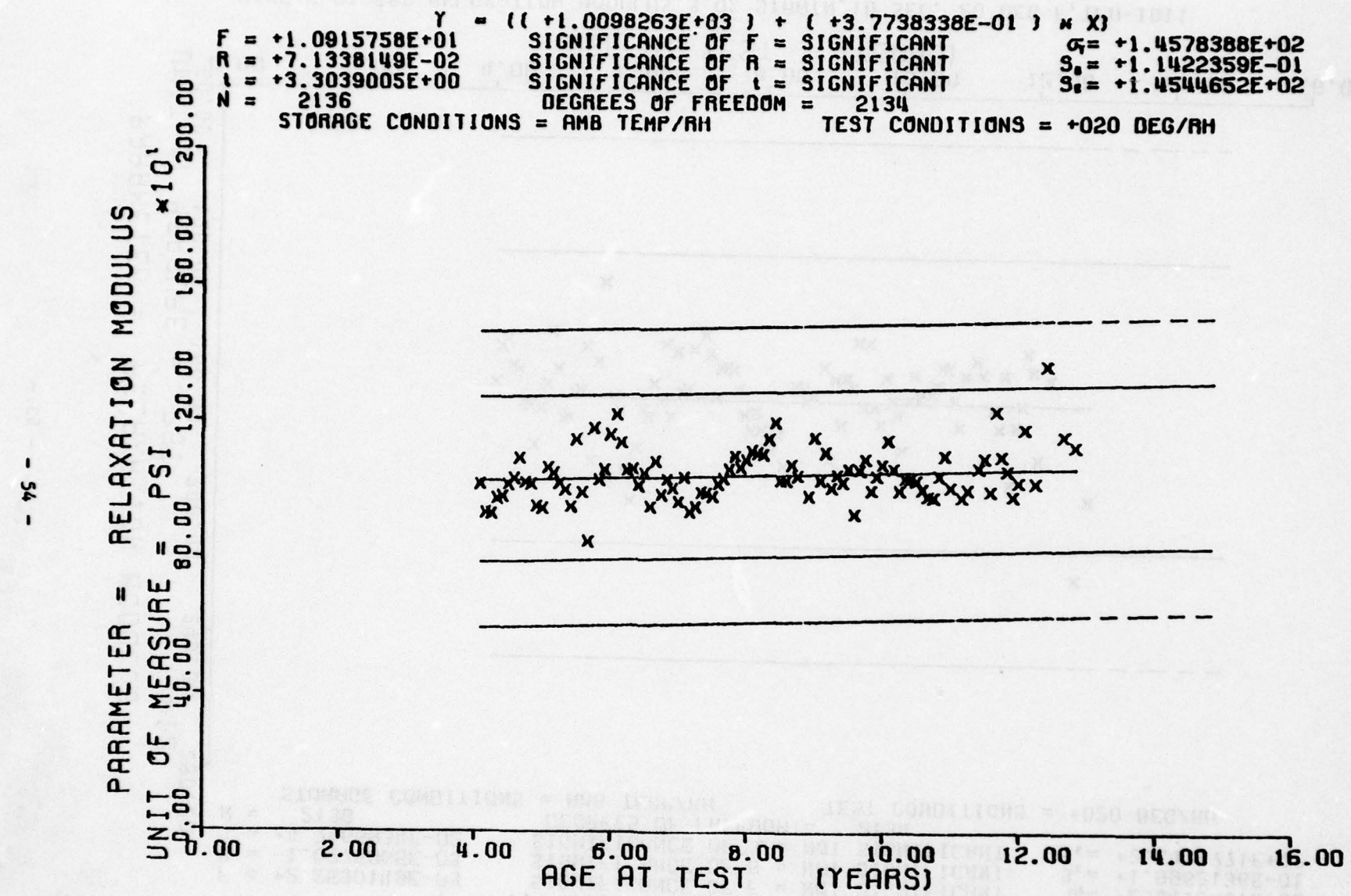
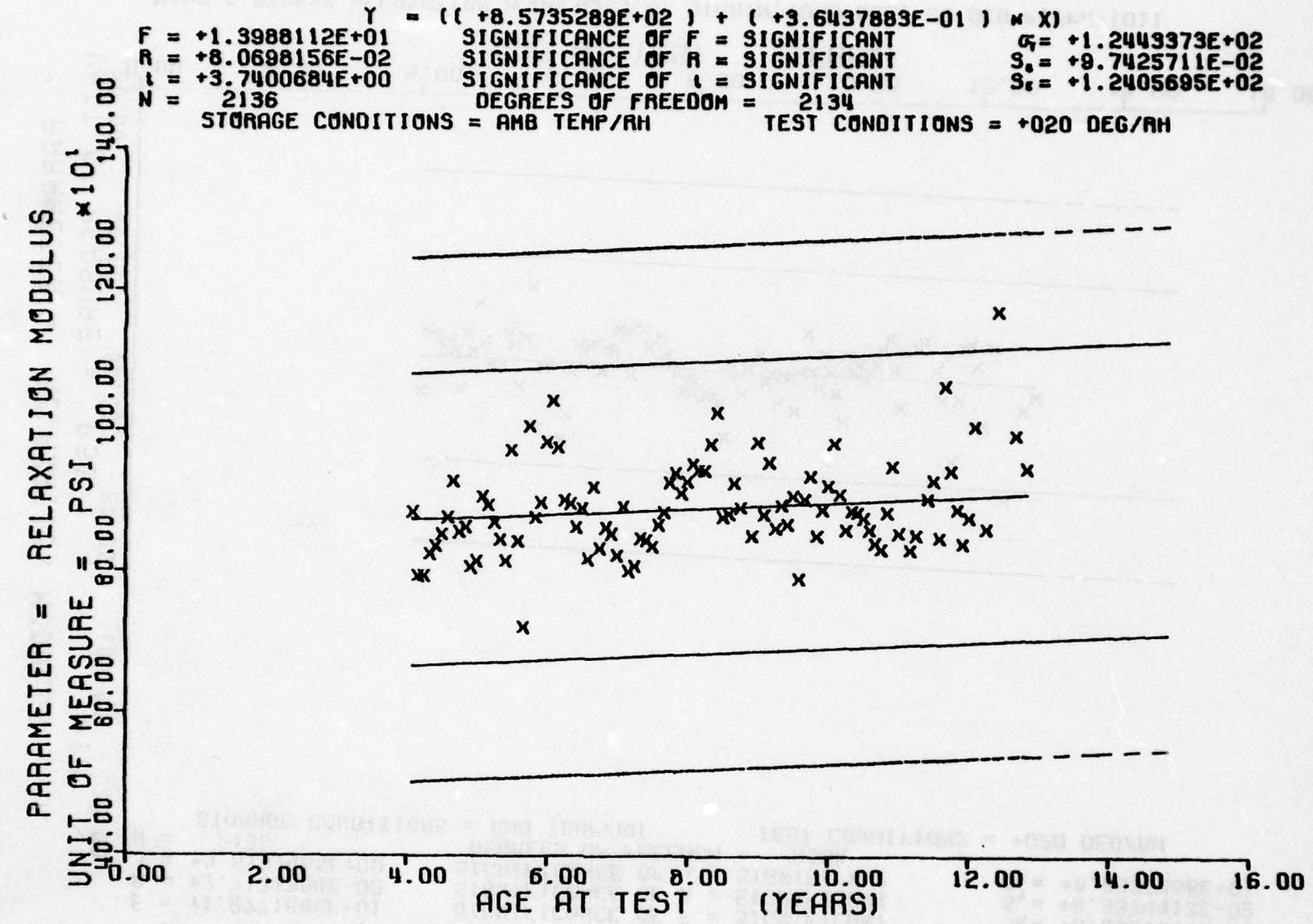

Y = ((+1.0098263E+03) + (+3.7738338E-01) * X)
F = +1.0915758E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.4578388E+02
R = +7.1338149E-02 SIGNIFICANCE OF R = SIGNIFICANT Sb = +1.1422359E-01
t = +3.3039005E+00 SIGNIFICANCE OF t = SIGNIFICANT Sa = +1.4544652E+02
N = 2136 DEGREES OF FREEDOM = 2134
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10¹
0.00
40.00
80.00
120.00
160.00
200.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,50 SEC, 20 DEG F,TPH-1011

Figure 35



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 20 DEG F, TPH-1011

Figure 36

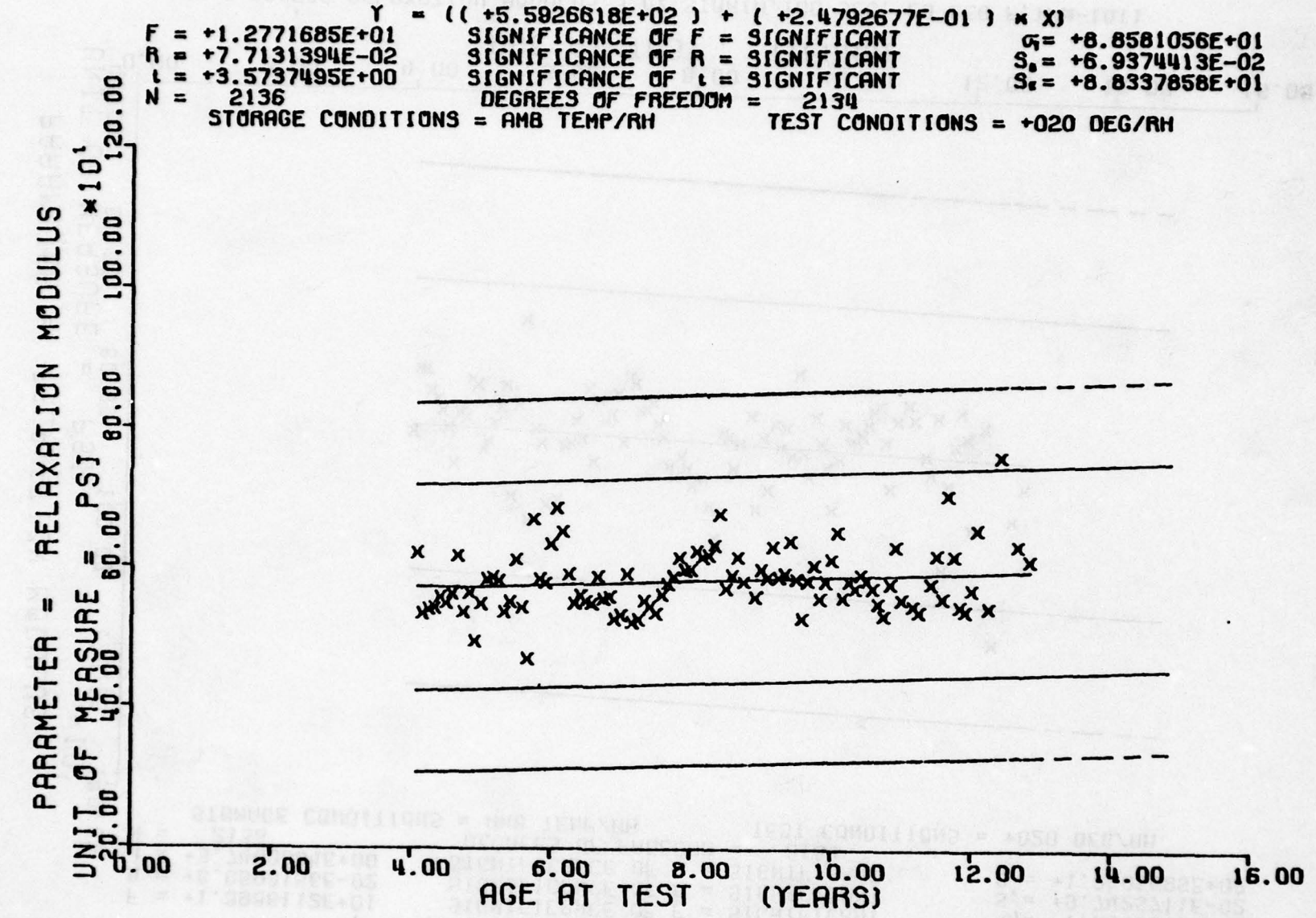

Y = ((+5.5926618E+02) + (+2.4792677E-01) * X)
F = +1.2771685E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +8.8581056E+01
R = +7.7131394E-02 SIGNIFICANCE OF R = SIGNIFICANT S = +6.9374413E-02
t = +3.5737495E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +8.8337858E+01
N = 2136 DEGREES OF FREEDOM = 2134
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10¹
20.00
40.00
60.00
80.00
100.00
120.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC, 20 DEG F,TPH-1011

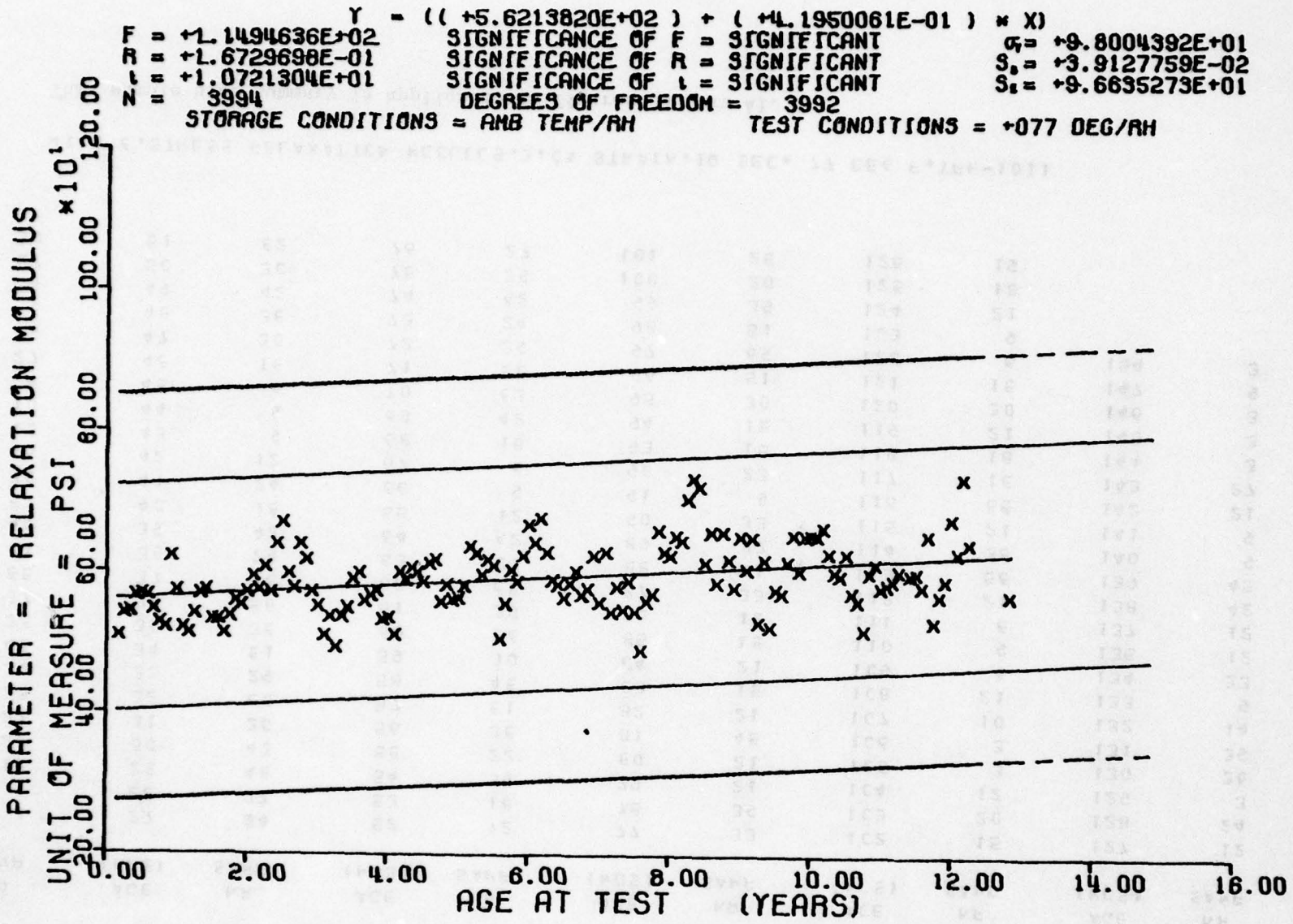
Figure 37

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
2	3	27	24	52	72	77	33	102	15	127	12
3	6	28	27	53	18	78	39	103	20	128	24
4	18	29	48	54	39	79	21	104	12	129	3
5	22	30	43	55	22	80	21	105	3	130	36
6	21	31	30	56	36	81	45	106	3	131	39
7	35	32	60	57	51	82	21	107	10	132	14
8	30	33	29	58	45	83	15	108	21	133	9
9	45	34	51	59	30	84	21	109	6	134	33
10	38	35	36	60	56	85	15	110	9	135	12
11	37	36	58	61	39	86	18	111	6	137	12
12	65	37	18	62	65	87	33	112	21	138	42
13	51	38	24	63	27	88	21	113	56	139	45
14	46	39	42	64	42	89	27	114	38	140	9
15	57	40	18	65	12	90	33	115	21	141	9
16	36	41	24	66	9	91	9	116	65	142	21
17	46	42	12	67	6	92	23	117	18	143	27
18	13	43	9	68	15	93	15	118	18	144	3
19	10	44	9	69	42	94	15	119	21	145	3
20	4	45	6	70	63	95	30	120	30	146	3
21	27	46	18	71	50	96	51	121	15	147	9
22	9	47	30	72	39	97	69	122	6	154	3
23	6	48	36	73	24	98	51	123	9		
24	34	49	42	74	42	99	39	124	21		
25	27	50	30	75	39	100	20	125	18		
26	30	51	82	76	27	101	28	126	15		

WING 6,STRESS RELAXATION MCCULLS,3.0% STRAIN,10 SEC. 77 DEG F,TPH-1011

This sample size summary is applicable to figures 38 thru 41.



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC, 77 DEG F,TPH-1011

Figure 38

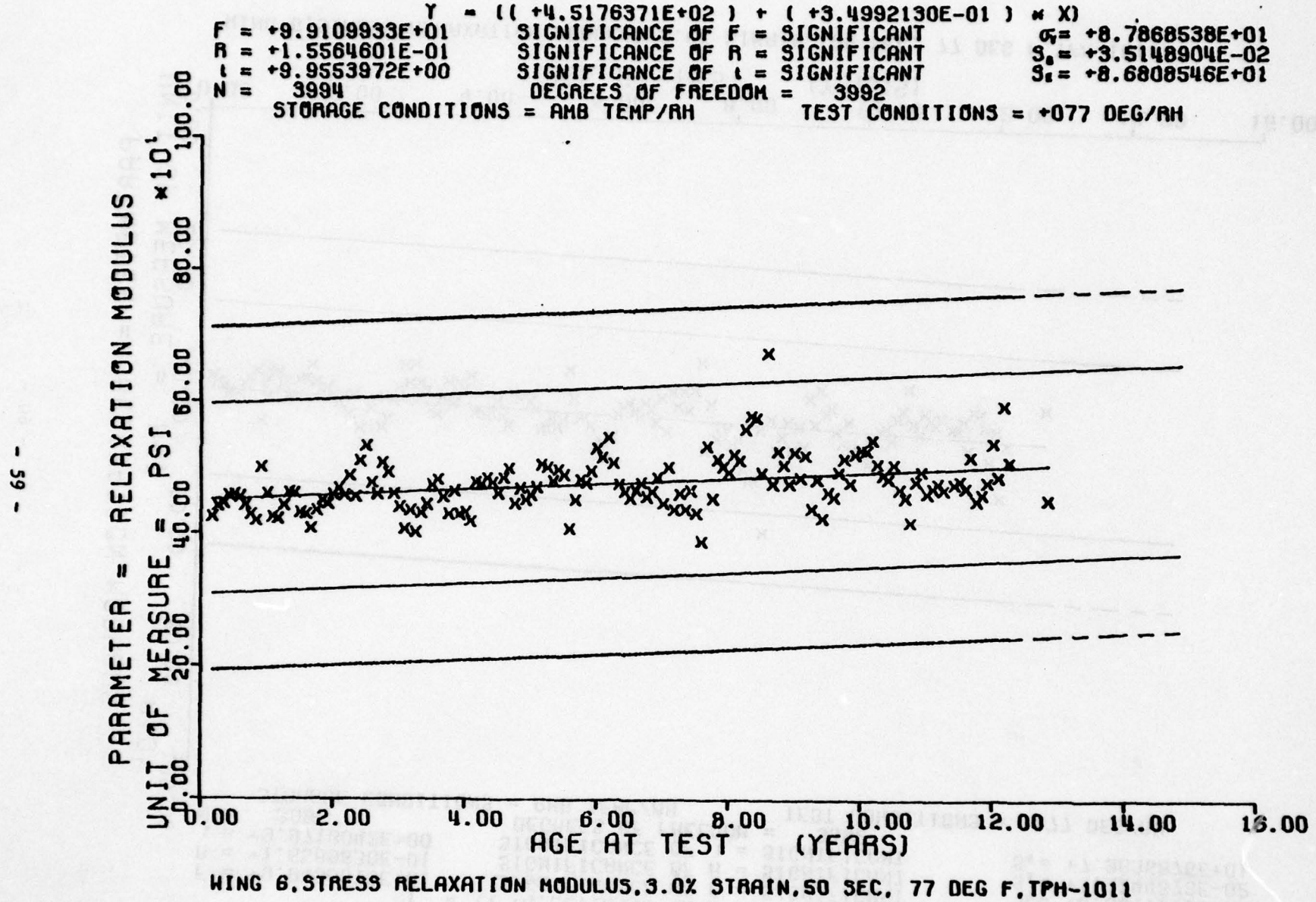

Y = ((+4.5176371E+02) + (+3.4992130E-01) * X)
F = +9.9109933E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +8.7868538E+01
R = +1.5564601E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +3.5148904E-02
t = +9.9553972E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +8.6808546E+01
N = 3994 DEGREES OF FREEDOM = 3992
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10¹
100.00
80.00
60.00
40.00
20.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,50 SEC, 77 DEG F,TPH-1011

Figure 39

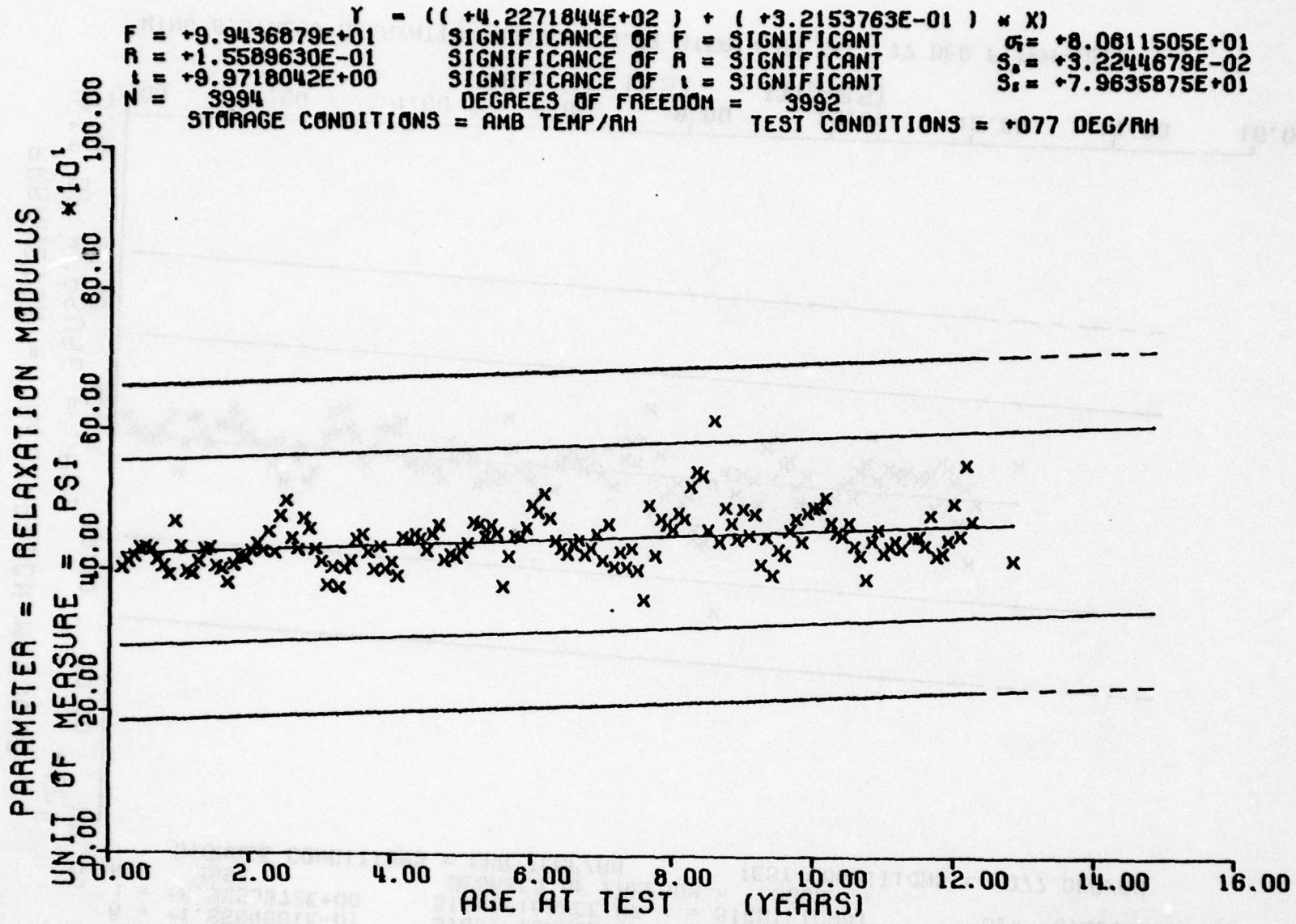
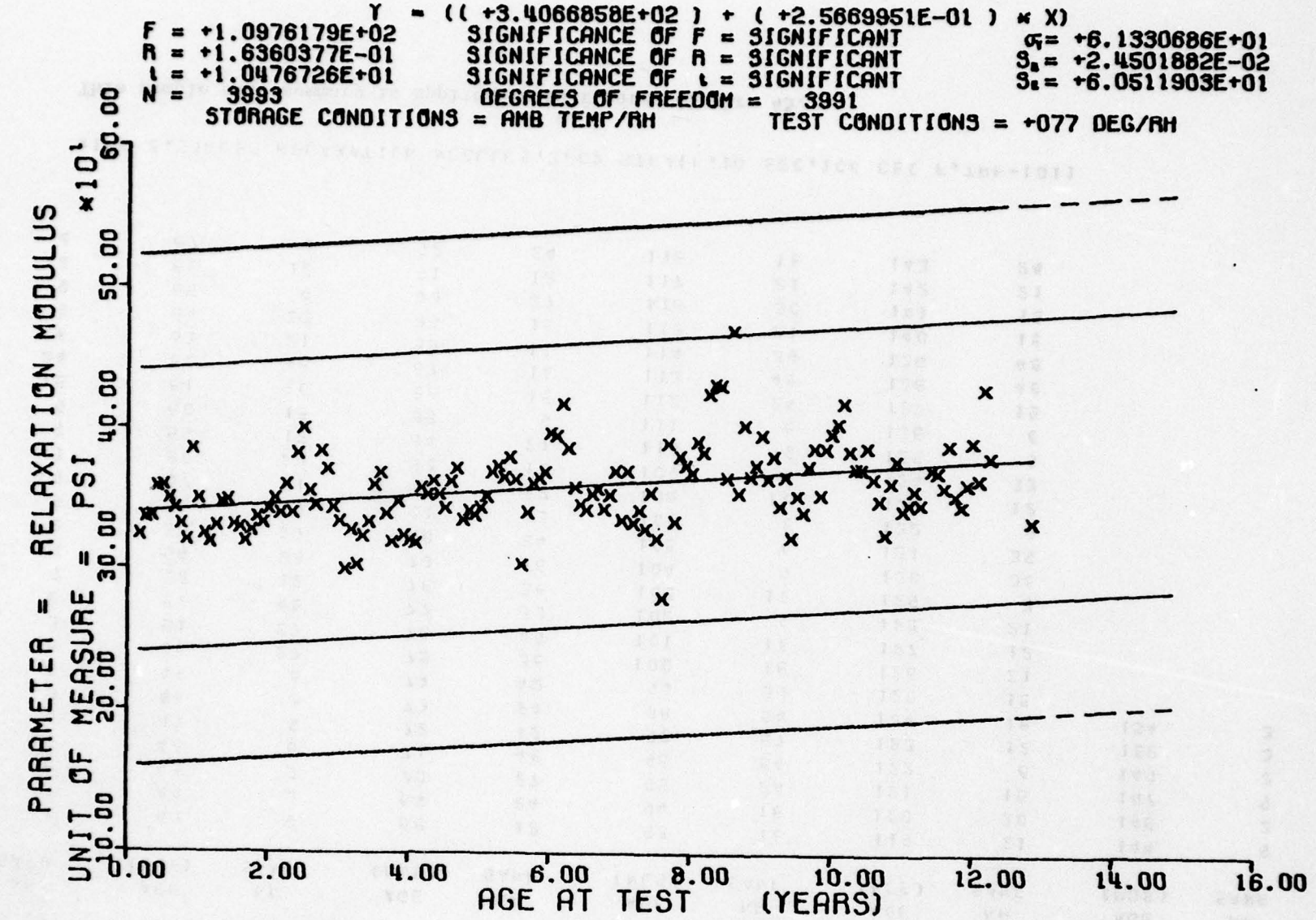

Y = ((+4.2271844E+02) + (+3.2153763E-01) * X)
F = +9.9436879E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = +1.5589630E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +9.9718042E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 3994 DEGREES OF FREEDOM = 3992
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH
σ = +8.0611505E+01
S = +3.2244679E-02
S = +7.9635875E+01
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI x10¹
100.00
80.00
60.00
40.00
20.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,100 SEC, 77 DEG F,TPH-1011

Figure 40



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC, 77 DEG F,TPH-1011

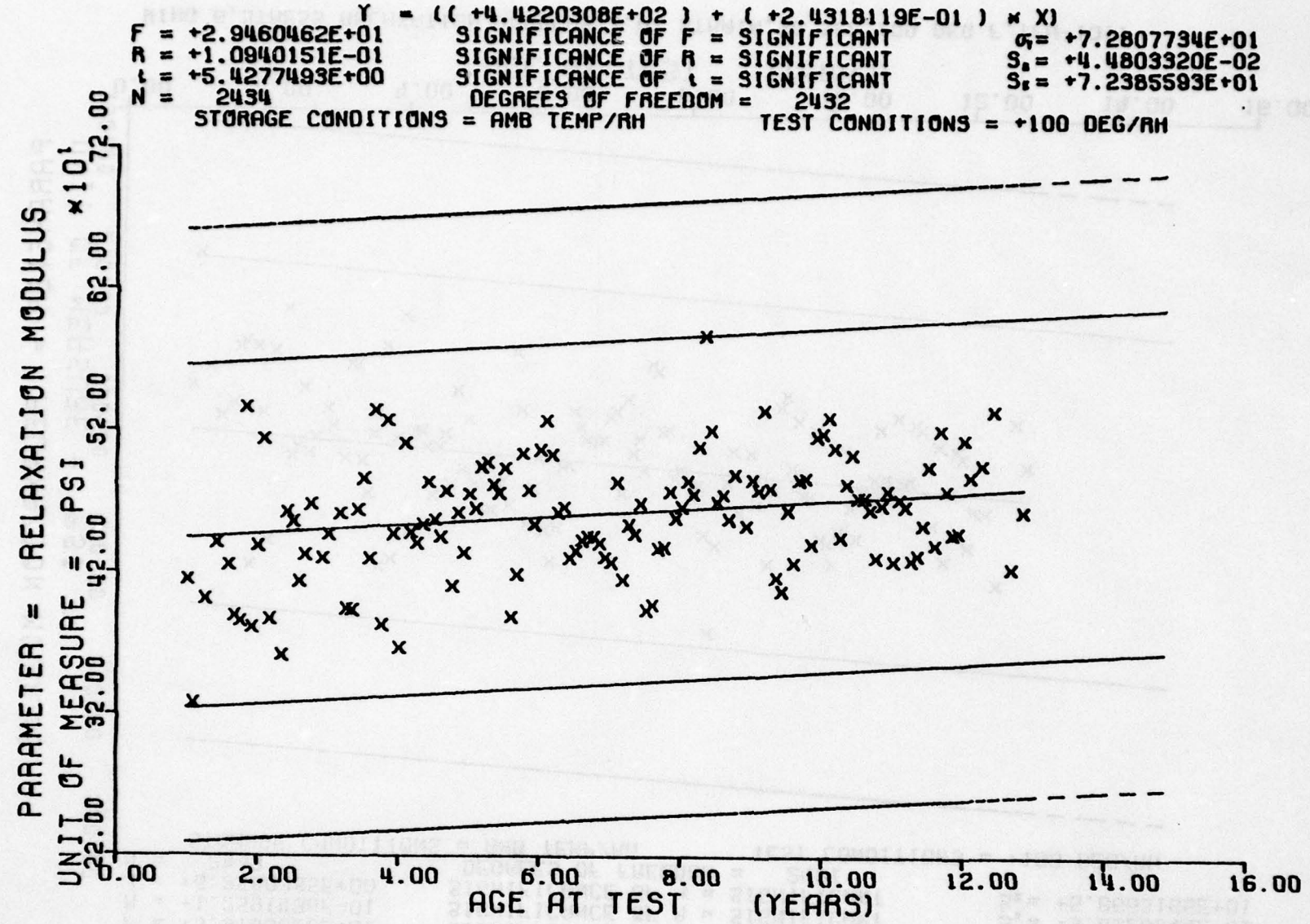
Figure 41

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
12	3	43	9	68	12	93	18	119	21	144	9
13	3	44	3	69	24	94	18	120	30	145	3
15	6	45	9	70	27	95	24	121	15	147	9
17	15	46	6	71	48	96	54	122	6	149	3
19	6	47	9	72	42	97	57	123	12	152	3
20	3	48	3	73	24	98	54	124	18	154	3
21	9	49	6	74	42	99	39	125	15		
22	6	50	27	75	36	100	18	126	21		
23	3	51	57	76	29	101	18	127	12		
24	6	52	45	77	33	102	9	128	21		
25	9	53	12	78	36	103	12	129	3		
26	9	54	28	79	18	104	9	130	36		
28	3	55	27	80	24	105	6	131	39		
29	9	56	27	81	33	107	6	132	9		
30	9	57	31	82	27	108	18	133	12		
31	3	58	24	83	18	109	6	134	33		
32	9	59	12	84	21	110	9	135	9		
33	9	60	15	85	9	111	6	136	6		
35	15	61	20	86	15	112	24	137	15		
36	24	62	48	87	12	113	45	138	48		
38	6	63	21	88	11	114	39	139	48		
39	9	64	33	89	15	115	21	140	15		
40	9	65	9	90	27	116	30	141	15		
41	12	66	12	91	12	117	21	142	21		
42	6	67	6	92	24	118	18	143	24		

WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,100 DEG F,TPT-1011

This sample size summary is applicable to figures 42 thru 45.



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,100 DEG F,TPH-1011

Figure 42

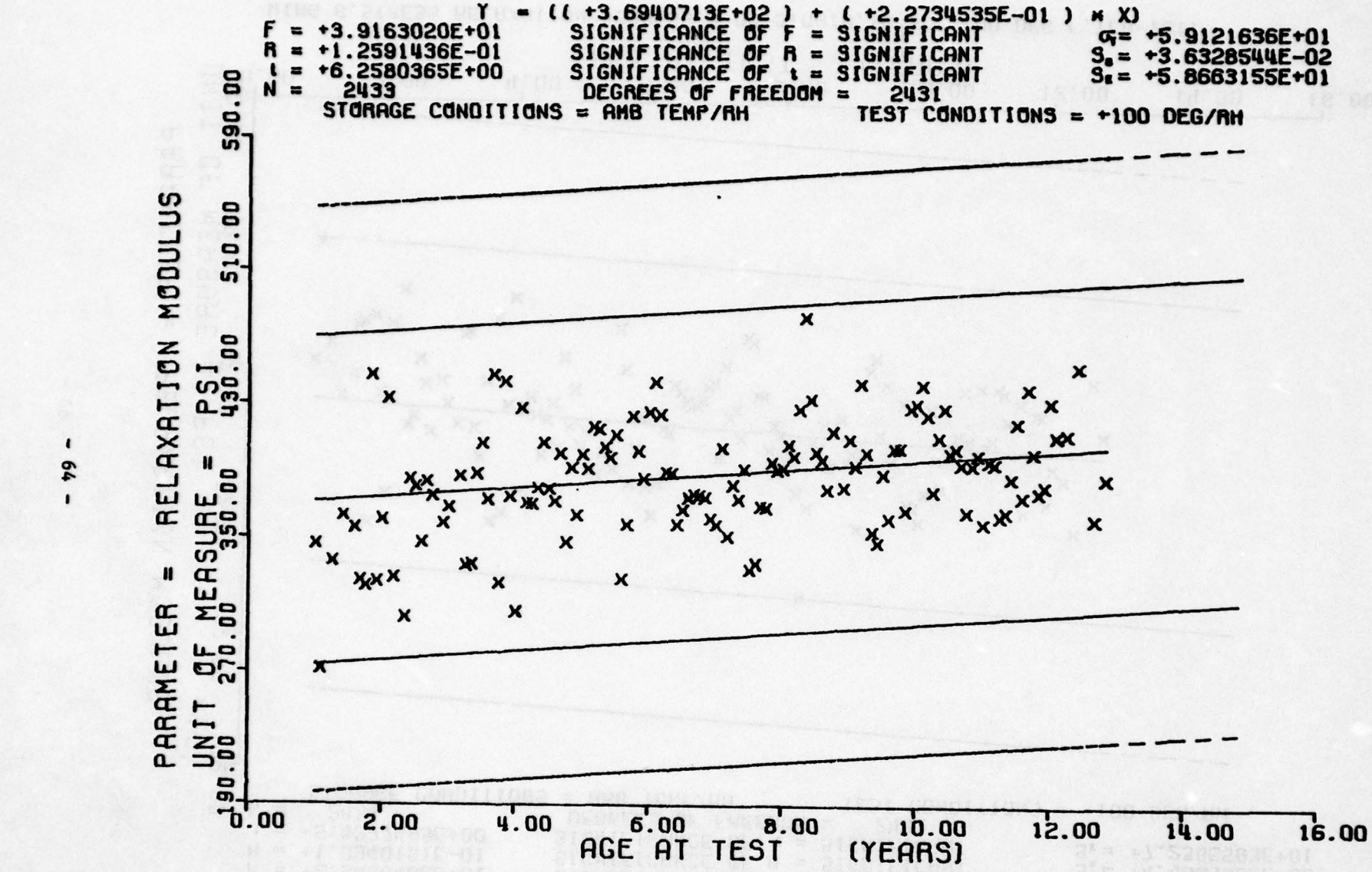
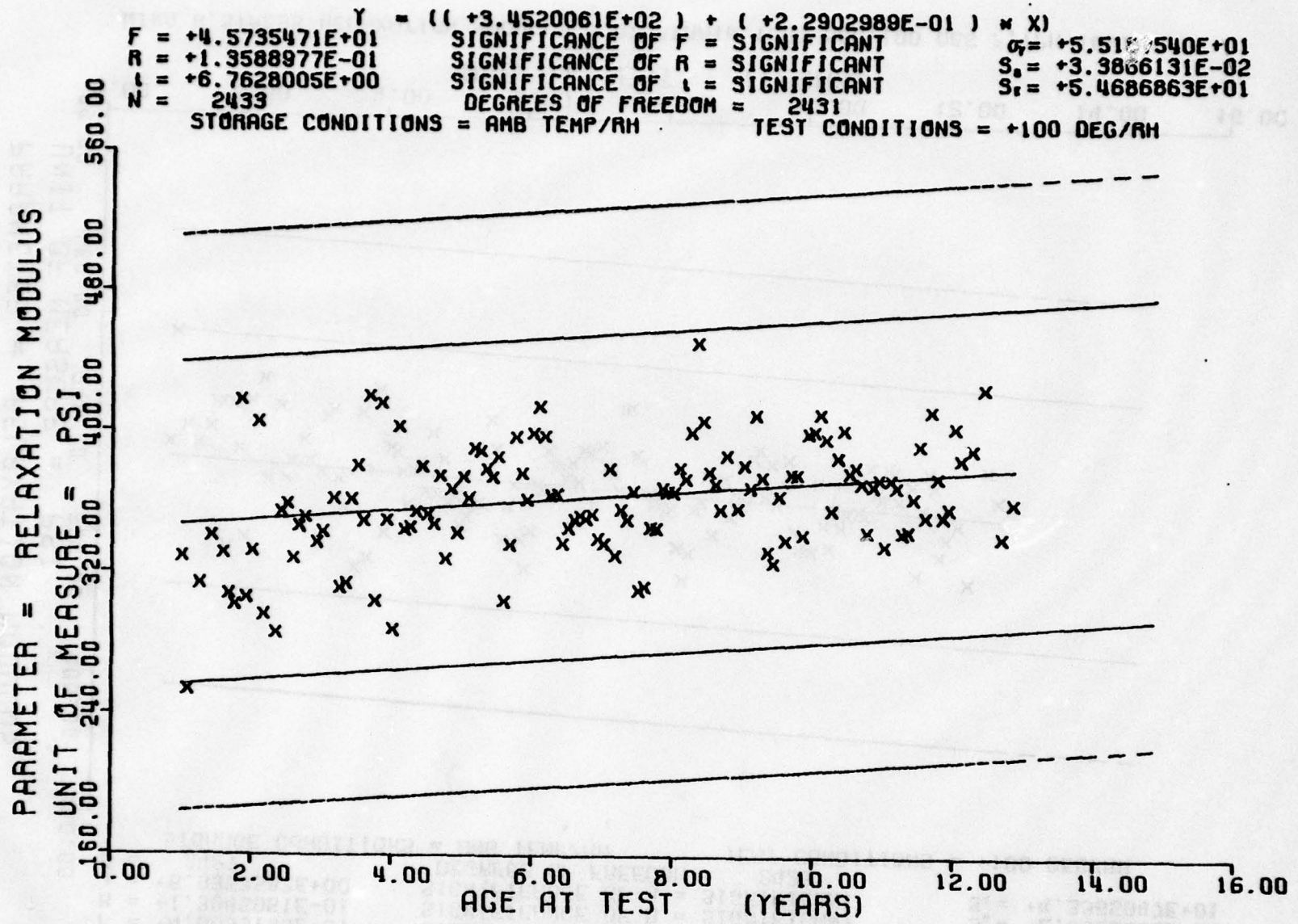

Y = ((+3.6940713E+02) + (+2.2734535E-01) x X)
F = +3.9163020E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +5.9121636E+01
R = +1.2591436E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +3.6328544E-02
t = +6.2580365E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +5.8663155E+01
N = 2433 DEGREES OF FREEDOM = 2431
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
590.00
510.00
430.00
350.00
270.00
190.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,50 SEC,100 DEG F,TPH-1011

Figure 43



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,100 SEC,100 DEG F,TPH-1011

Figure 44

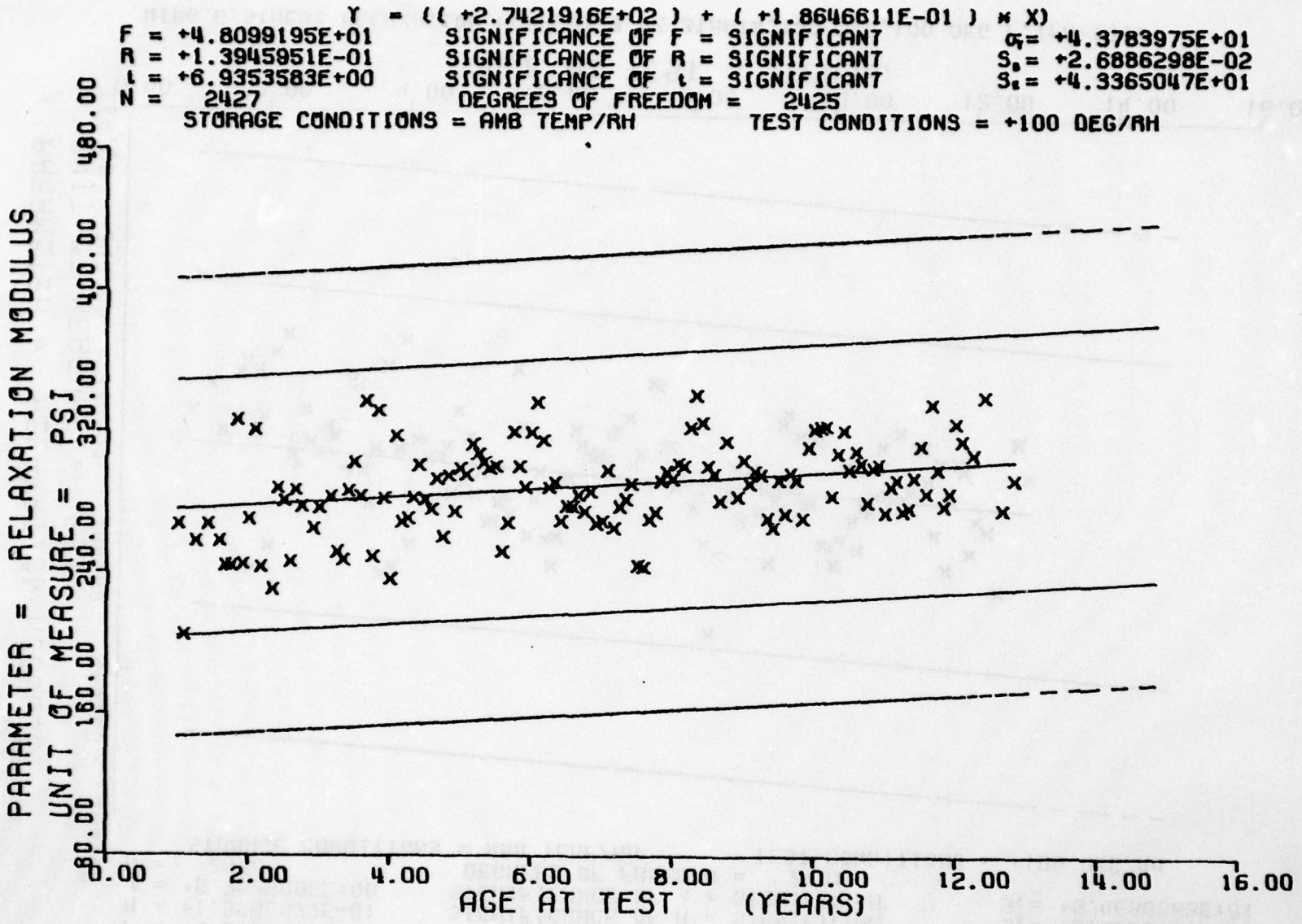

Y = ((+2.7421916E+02) + (+1.8646611E-01) * X)
F = +4.8099195E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +4.3783975E+01
R = +1.3945951E-01 SIGNIFICANCE OF R = SIGNIFICANT S_e = +2.6886298E-02
t = +6.9353583E+00 SIGNIFICANCE OF t = SIGNIFICANT S_t = +4.3365047E+01
N = 2427 DEGREES OF FREEDOM = 2425
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
80.00
160.00
240.00
320.00
400.00
480.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC,100 DEG F,TPH-1011

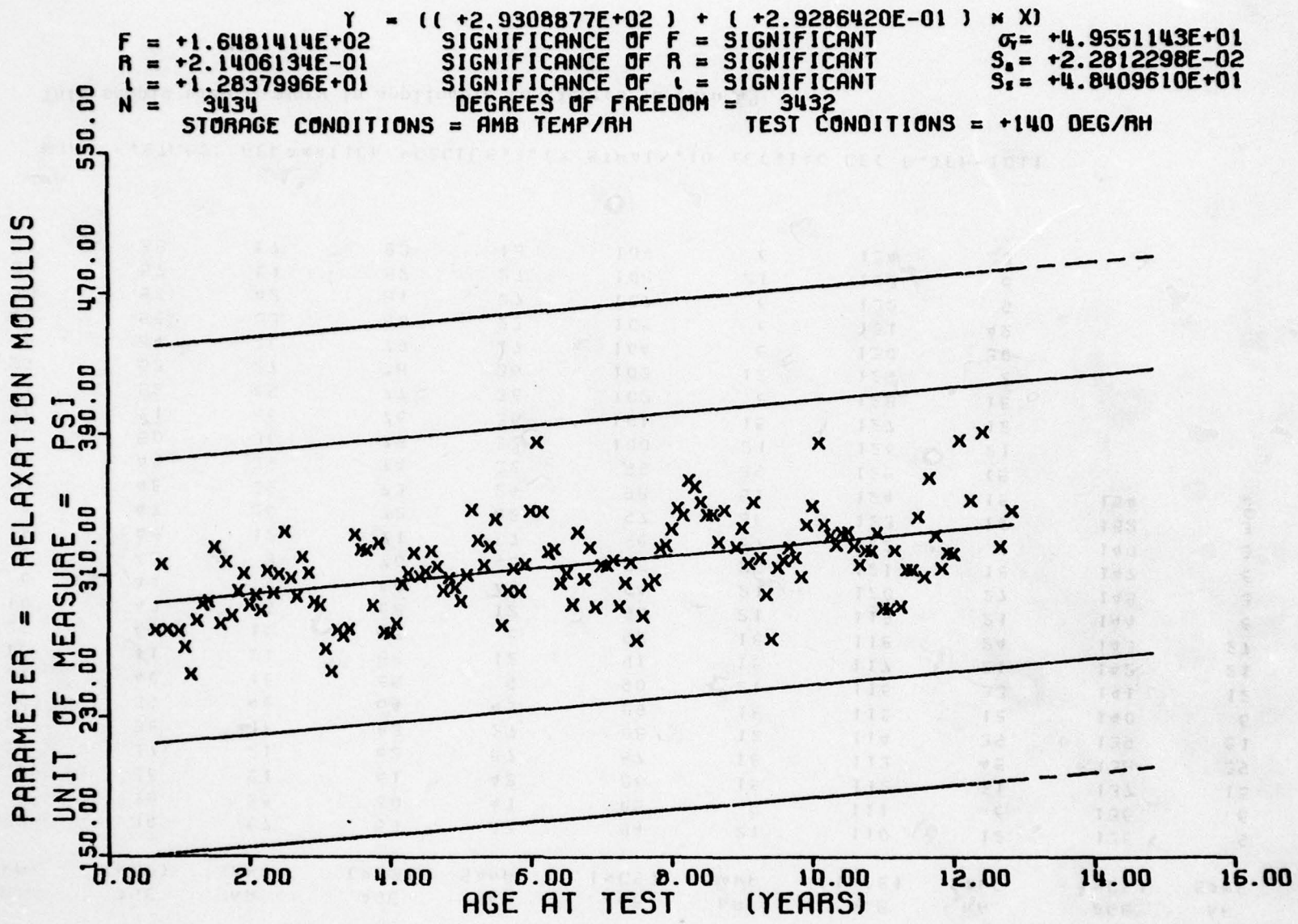
Figure 45

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	34	57	59	33	84	21	110	12	135	9
9	9	35	36	60	47	85	9	111	6	136	6
10	6	36	51	61	48	86	15	112	21	137	15
12	24	37	21	62	57	87	18	113	45	138	39
13	27	38	18	63	27	98	12	114	39	139	51
14	9	39	48	64	45	89	18	115	18	140	6
15	27	40	18	65	9	90	21	116	33	141	12
16	15	41	21	66	12	91	15	117	21	142	21
17	39	42	15	67	6	92	18	118	24	143	27
18	10	43	9	68	12	93	21	119	21	144	6
19	6	44	9	69	48	94	21	120	27	145	3
20	6	45	3	70	45	95	20	121	18	147	6
21	18	46	12	71	57	96	57	122	6	149	3
22	6	47	30	72	42	97	56	123	12	152	3
23	9	48	39	73	24	98	51	124	15	154	3
24	33	49	39	74	38	99	39	125	15		
25	30	50	36	75	33	100	21	126	21		
26	30	51	66	76	36	101	15	127	12		
27	21	52	69	77	36	102	8	128	18		
28	27	53	27	78	36	103	12	129	2		
29	48	54	30	79	17	104	6	130	30		
30	45	55	33	80	23	105	6	131	42		
31	33	56	42	81	27	107	6	132	9		
32	57	57	51	82	27	108	21	133	6		
33	27	58	57	83	18	109	6	134	33		

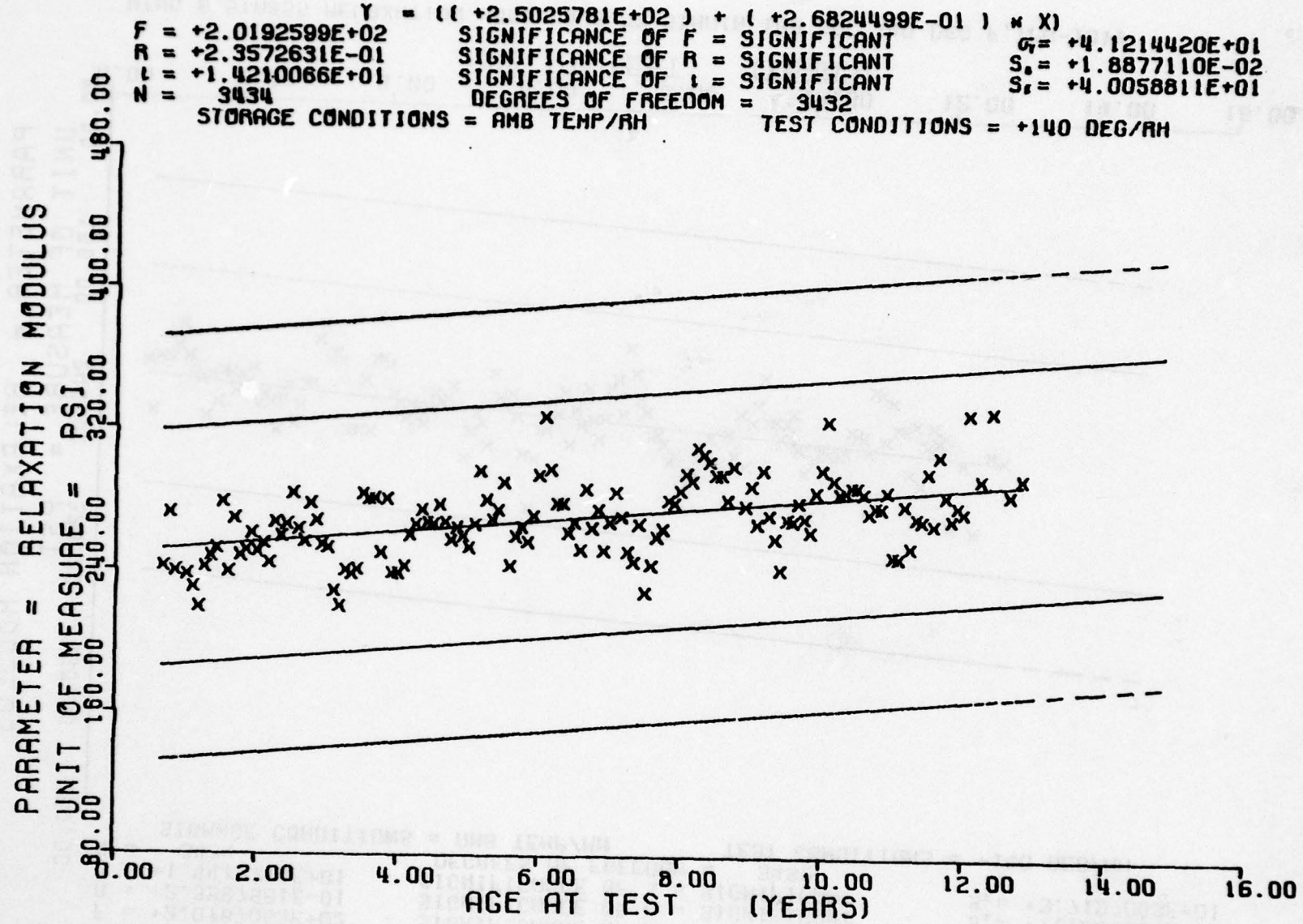
WING 6,STRESS RELAXATION MCCULLS,3.0% STRAIN,10 SEC,140 DEG F,TFE-1011

This sample size summary is applicable to figures 46 thru 49



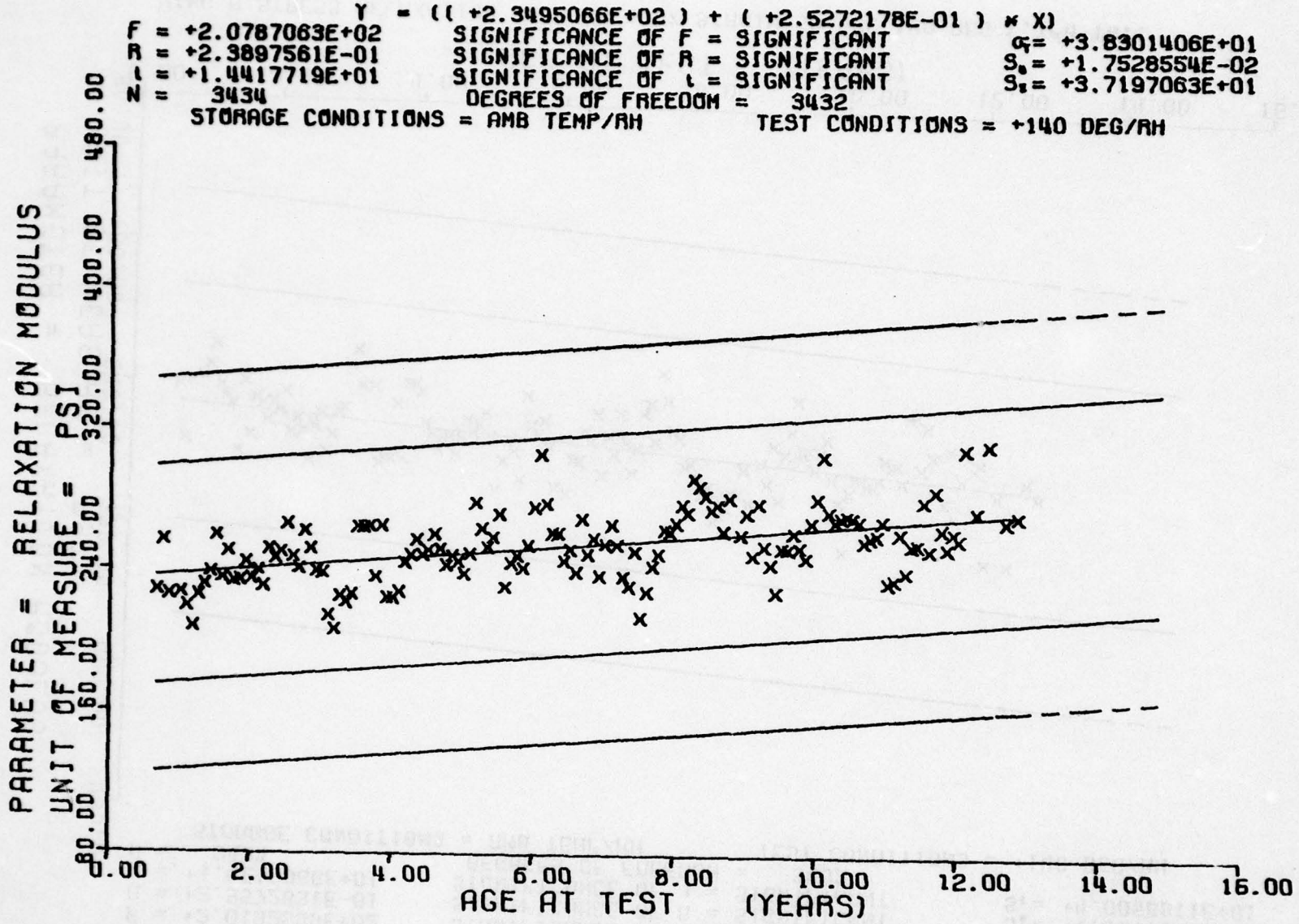
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,140 DEG F,TPH-1011

Figure 46



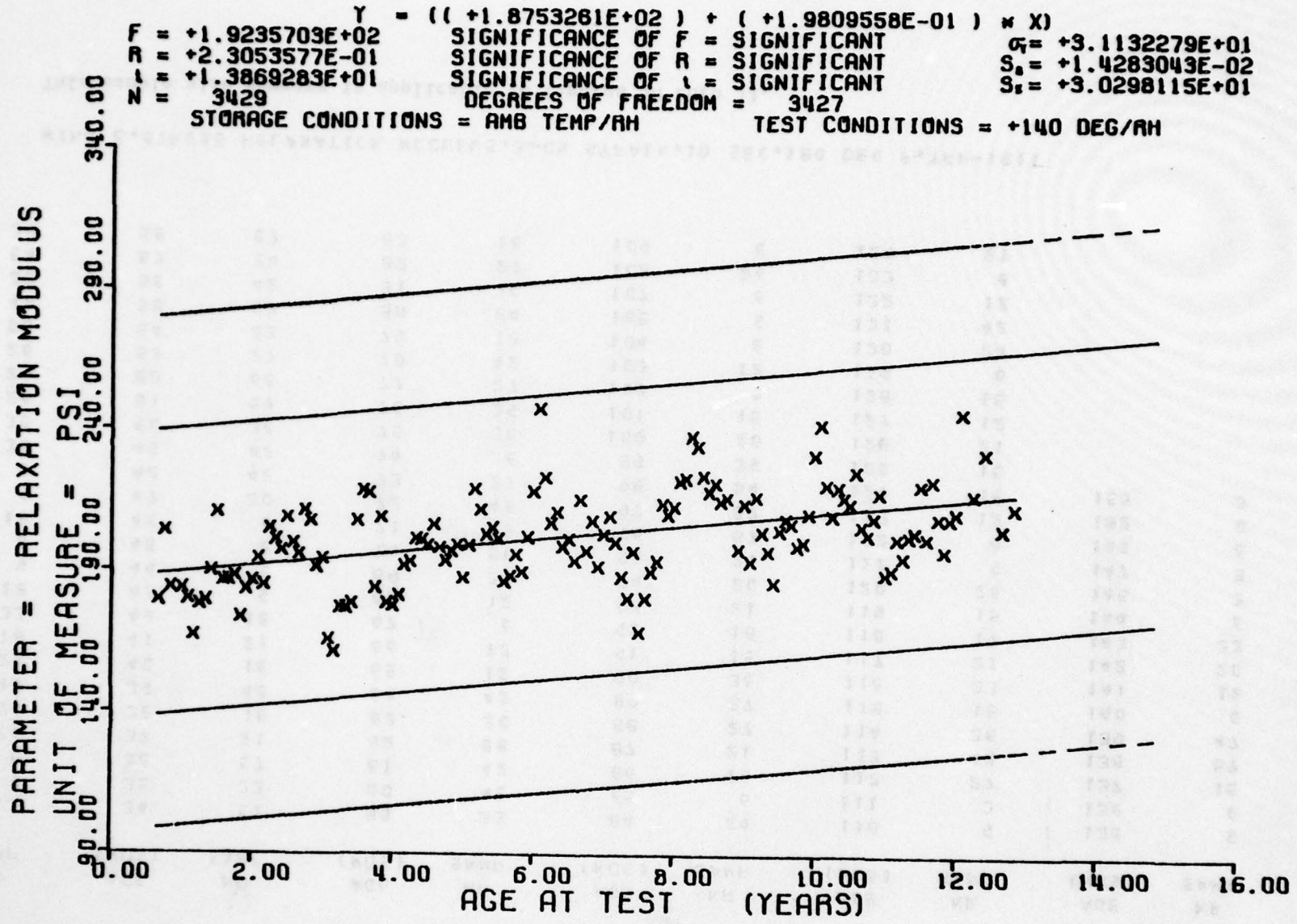
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 140 DEG F, TPH-1011

Figure 47



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 140 DEG F, TPH-1011

Figure 48



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 140 DEG F, TPH-1011

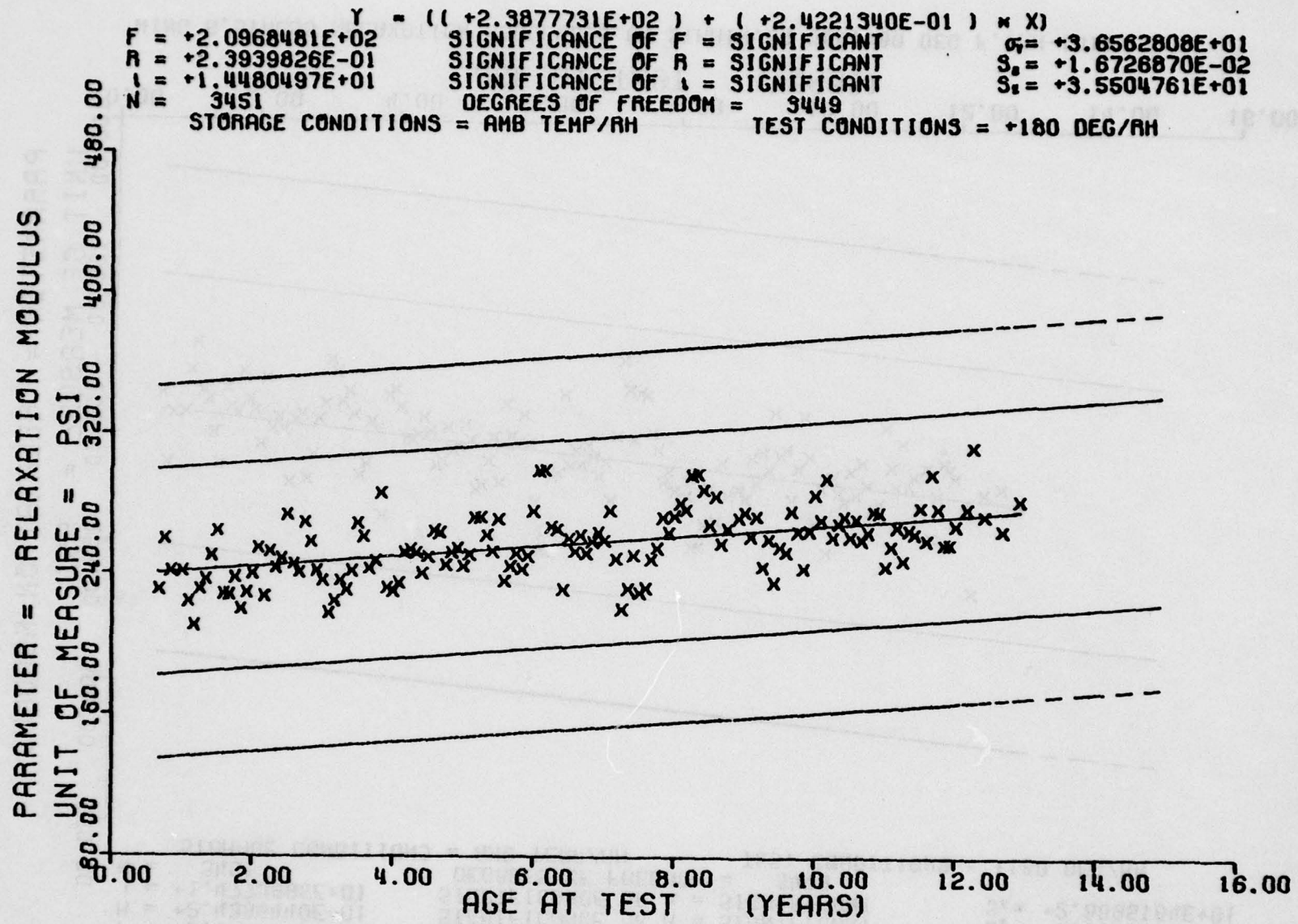
Figure 49

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	34	51	59	33	84	24	110	9	135	9
9	9	35	33	60	45	85	6	111	3	136	6
10	6	36	57	61	42	86	18	112	27	137	15
12	24	37	21	62	58	87	21	113	48	138	57
13	24	38	18	63	30	88	27	114	36	139	47
14	12	39	48	64	42	89	27	115	15	140	6
15	24	40	18	65	12	90	36	116	33	141	12
16	18	41	21	66	12	91	15	117	21	142	20
17	33	42	18	67	6	92	18	118	17	143	33
18	18	43	9	68	12	93	21	119	15	144	6
19	9	44	6	69	39	94	20	120	26	146	3
20	6	45	6	70	50	95	21	121	9	147	3
21	18	46	6	71	33	96	57	122	6	149	6
22	9	47	30	72	48	97	57	123	12	152	2
23	9	48	42	73	27	98	54	124	15	155	3
24	30	49	42	74	36	99	39	125	15		
25	35	50	36	75	36	100	20	126	21		
26	24	51	57	76	39	101	15	127	12		
27	24	52	66	77	27	102	9	128	15		
28	26	53	27	78	42	103	12	129	6		
29	50	54	33	79	18	104	6	130	24		
30	42	55	33	80	24	105	9	131	42		
31	33	56	42	81	30	107	6	132	12		
32	54	57	54	82	27	108	24	133	6		
33	30	58	57	83	18	109	6	134	21		

WING 6,STRESS RELAXATION MCCULLS,3.0% STRAIN,10 SEC,180 DEG F,TPH-1011

This sample size summary is applicable to figures 50 thru 53.



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 180 DEG F, TPH-1011

Figure 50

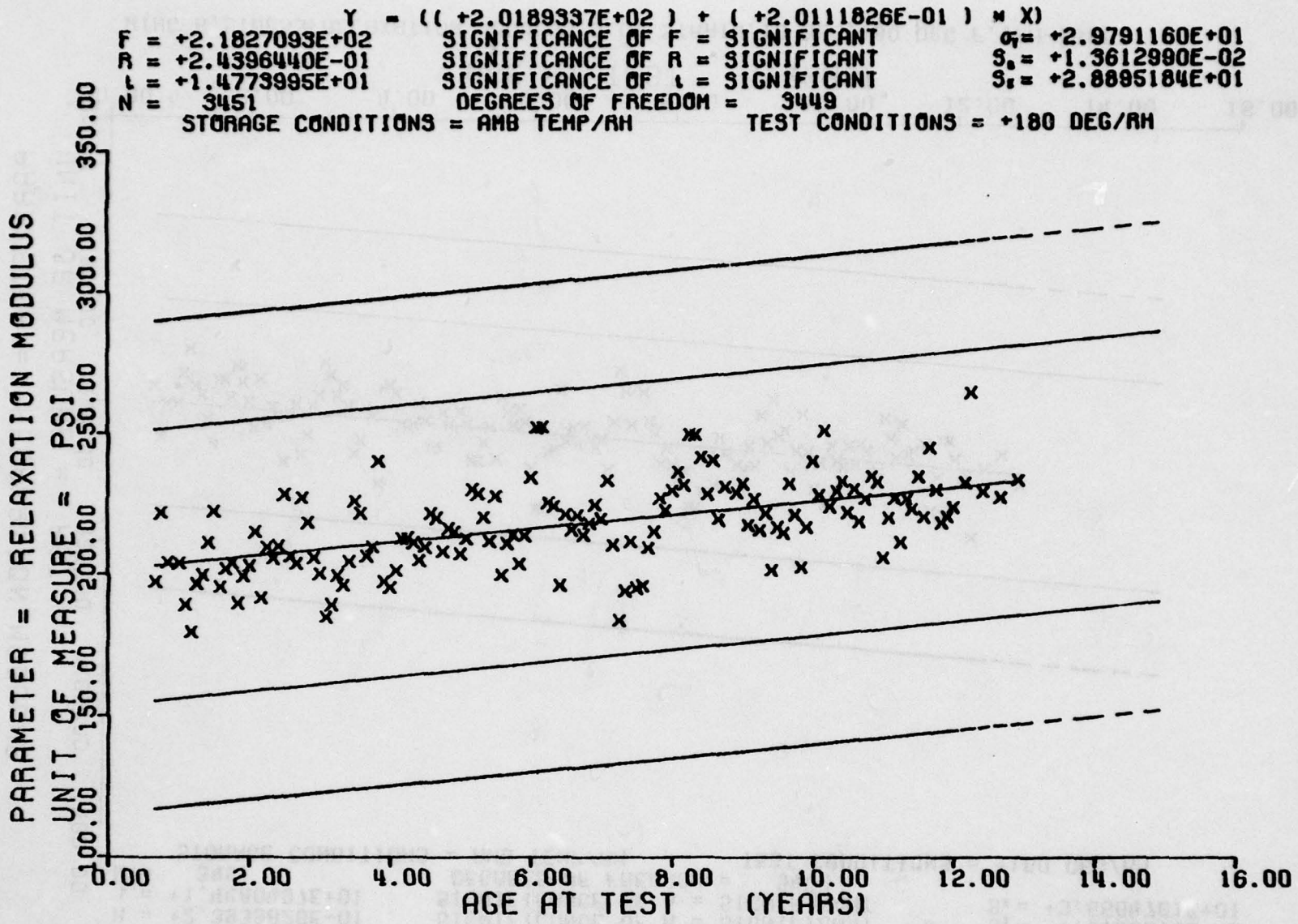

Y = ((+2.0189337E+02) + (+2.0111826E-01) * X)
F = +2.1827093E+02
SIGNIFICANCE OF F = SIGNIFICANT
σ1 = +2.9791160E+01
R = +2.4396440E-01
SIGNIFICANCE OF R = SIGNIFICANT
Sb = +1.3612980E-02
t = +1.4773995E+01
SIGNIFICANCE OF t = SIGNIFICANT
Sr = +2.8895184E+01
N = 3451
DEGREES OF FREEDOM = 3449
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = +180 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
100.00
150.00
200.00
250.00
300.00
350.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,50 SEC,180 DEG F,TPH-1011

Figure 51

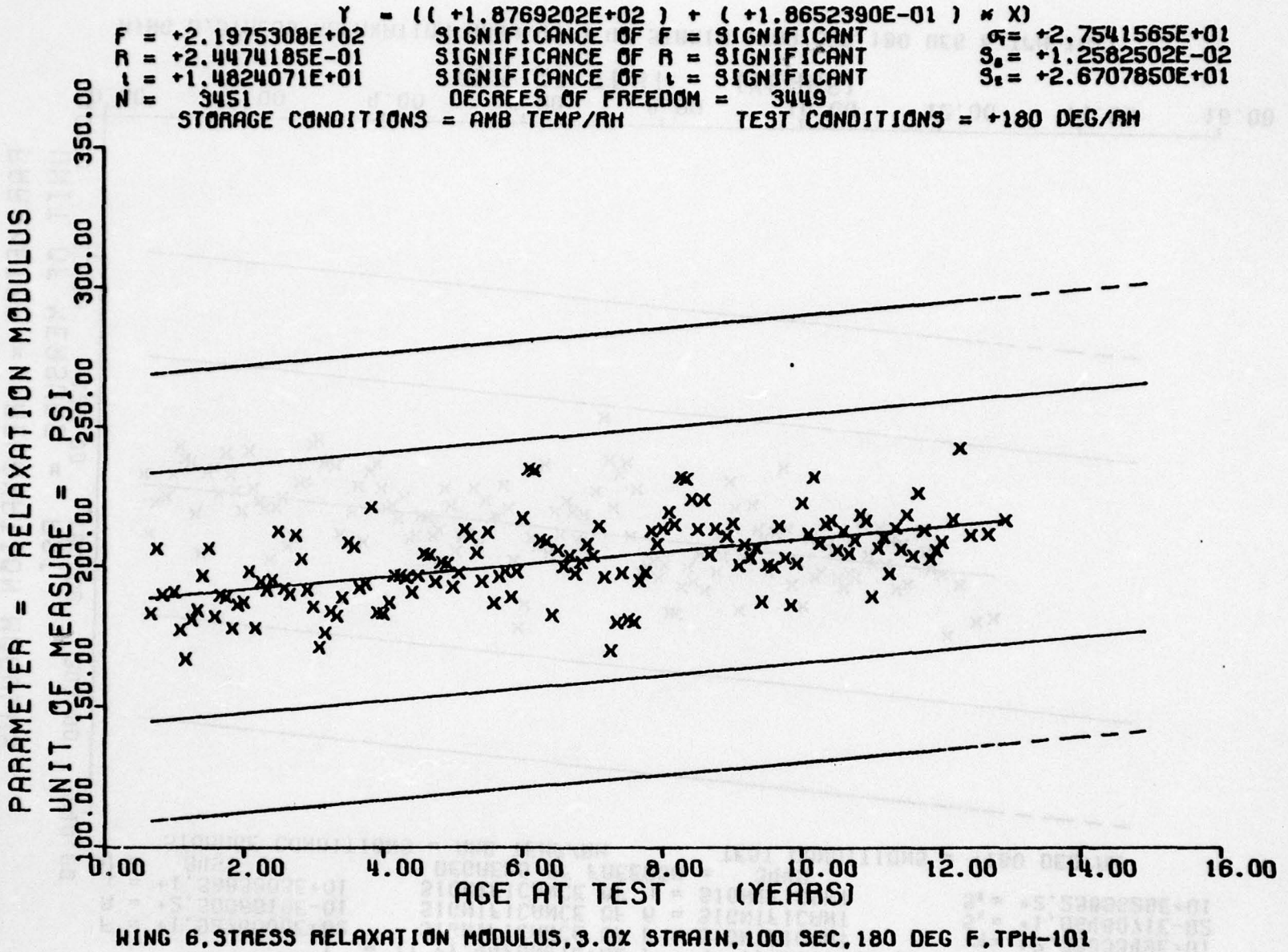

Y = ((+1.8769202E+02) + (+1.8652390E-01) * X)
F = +2.1975308E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +2.7541565E+01
R = +2.4474185E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +1.2582502E-02
t = +1.4824071E+01 SIGNIFICANCE OF t = SIGNIFICANT S = +2.6707850E+01
N = 3451 DEGREES OF FREEDOM = 3449
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
100.00
150.00
200.00
250.00
300.00
350.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,100 SEC,180 DEG F,TPH-101

Figure 52

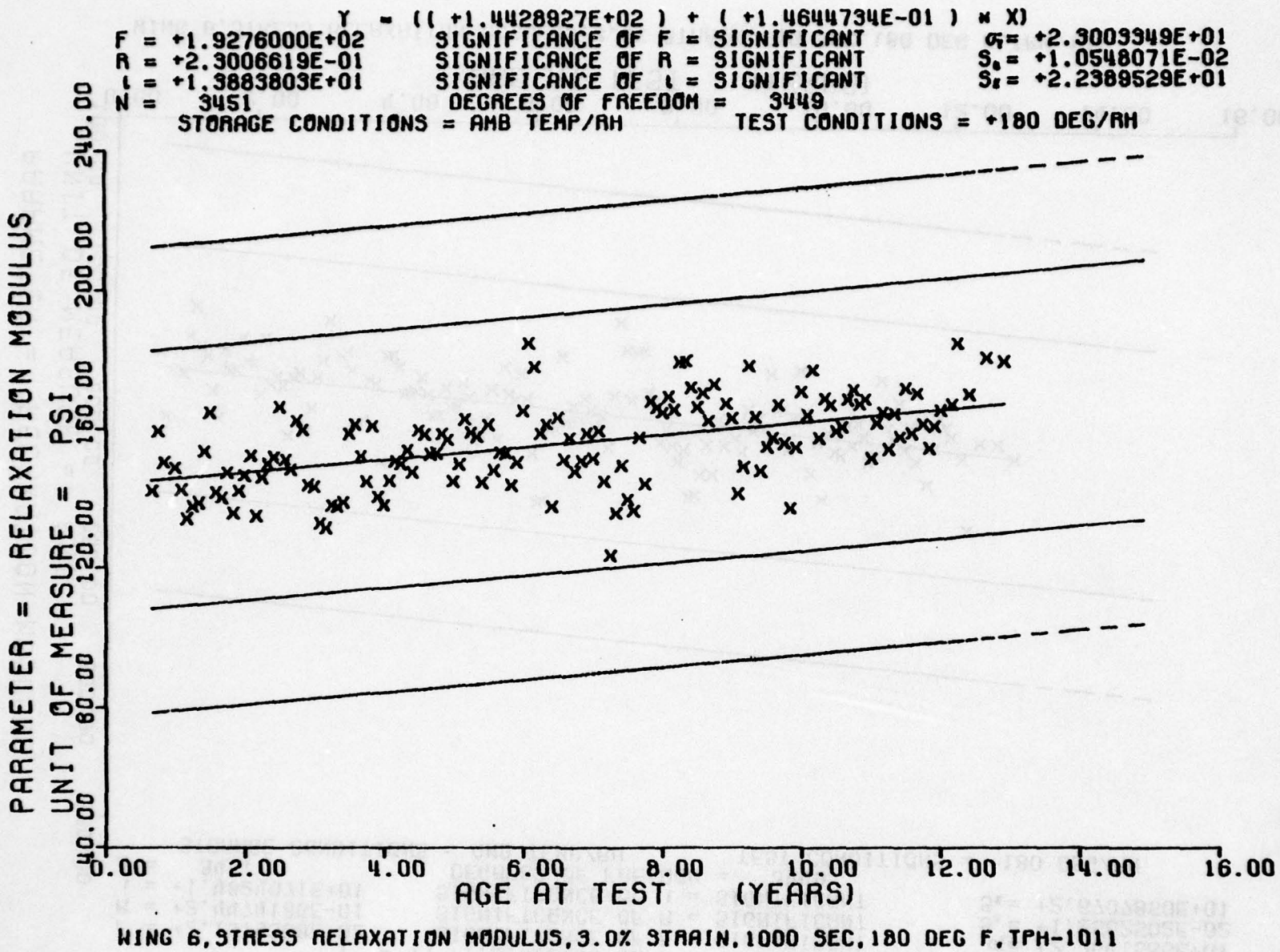

Y = ((+1.4428827E+02) + (+1.4644734E-01) * X)
F = +1.9276000E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +2.3009349E+01
R = +2.3006619E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +1.0548071E-02
ι = +1.3883803E+01 SIGNIFICANCE OF ι = SIGNIFICANT S = +2.2389529E+01
N = 3451 DEGREES OF FREEDOM = 3449
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +180 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
40.00
80.00
120.00
160.00
200.00
240.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC,180 DEG F,TPH-1011

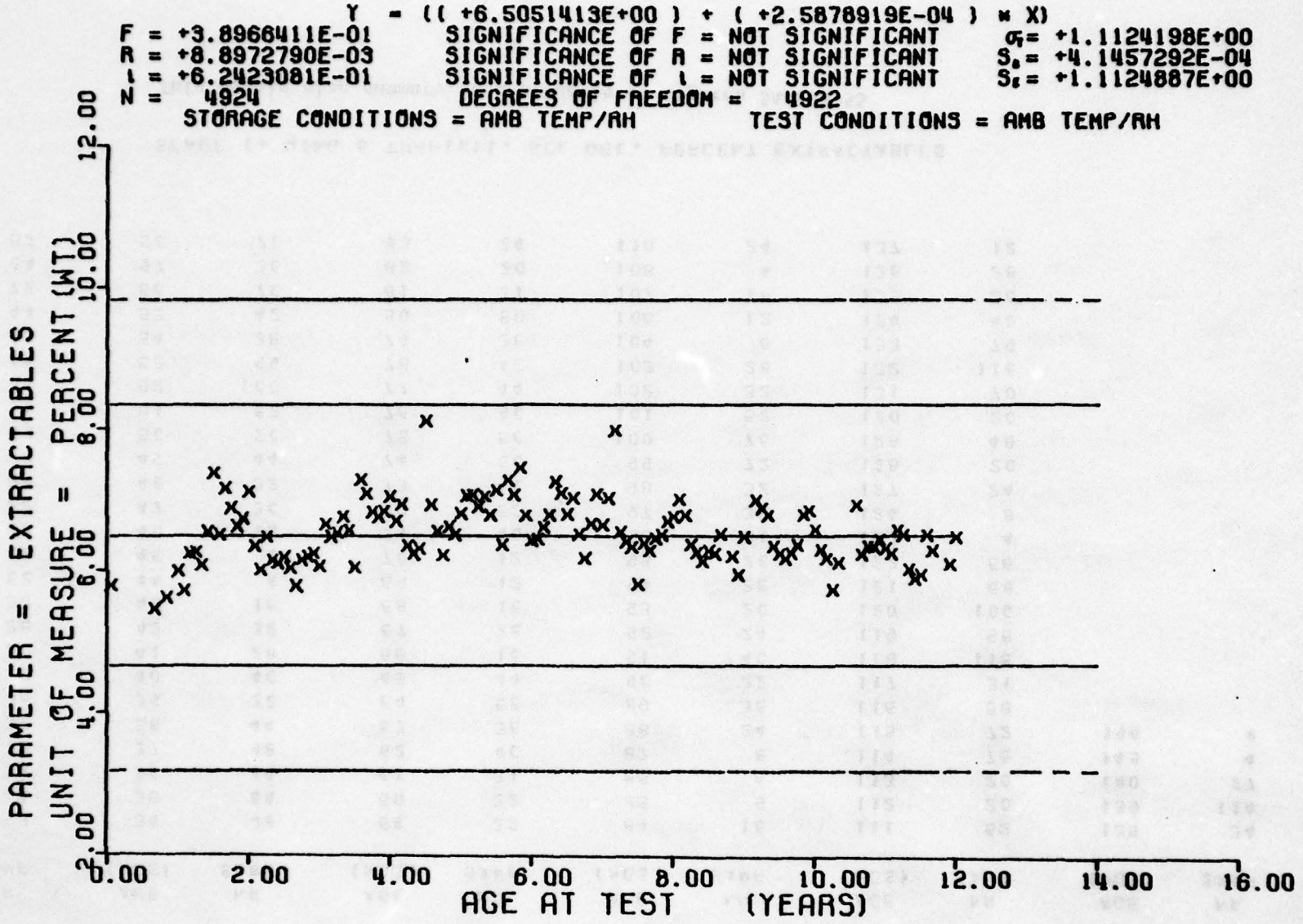
Figure 53

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
1	3	34	48	59	32	84	16	111	52	138	34
8	4	35	64	60	32	85	9	112	20	139	114
10	24	36	44	61	31	86	4	113	20	140	27
12	12	37	48	62	40	87	8	114	76	143	4
13	32	38	44	63	36	88	24	115	72	144	4
14	36	39	32	64	56	89	36	116	58		
15	20	40	40	65	44	90	32	117	31		
16	20	41	28	66	16	91	40	118	116		
17	28	42	12	67	28	92	24	119	95		
18	32	43	16	68	16	93	20	120	100		
19	52	44	4	69	12	94	28	121	68		
20	12	45	8	70	12	95	28	122	56		
21	32	46	16	71	40	96	31	123	4		
22	28	47	36	72	52	97	39	124	8		
23	24	48	32	73	40	98	32	127	24		
24	8	49	44	74	80	99	72	128	20		
25	40	50	20	75	56	100	76	129	48		
26	56	51	52	76	40	101	52	130	20		
27	32	52	100	77	44	102	32	131	70		
28	44	53	99	78	42	103	28	132	116		
29	43	54	38	79	36	104	8	133	79		
30	44	55	42	80	50	106	12	134	48		
31	72	56	70	81	31	107	16	135	36		
32	64	57	36	82	20	108	4	136	28		
33	52	58	70	83	24	110	24	137	12		

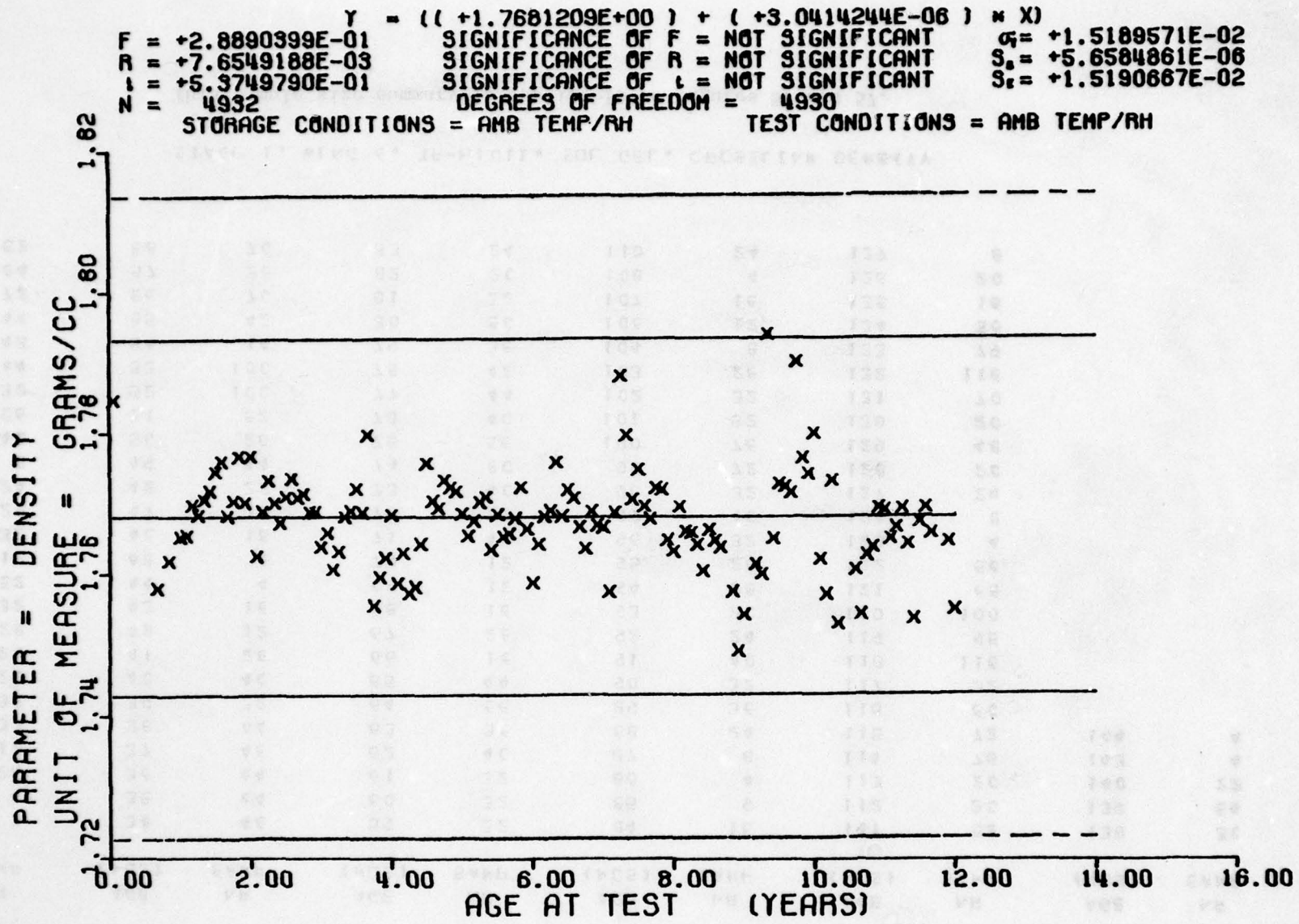
STAGE 1, WING 6 TP-F1C11, SCL GEL, PERCENT EXTRACTABLES

This sample size summary is applicable to figures 54 and 55



STAGE 1, WING 6 TP-H1011, SOL GEL, PERCENT EXTRACTABLES

Figure 54



STAGE 1, WING 6, TP-H1011, SOL GEL, DENSITY

Figure 55

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
1	3	34	48	59	32	84	16	111	52	138	30
8	4	35	64	60	32	85	9	112	20	139	54
10	24	36	44	61	32	86	4	113	20	140	22
12	12	37	48	62	40	87	8	114	76	143	4
13	32	38	44	63	36	88	24	115	72	144	4
14	36	39	32	64	56	89	36	116	60		
15	20	40	40	65	44	90	32	117	32		
16	20	41	28	66	16	91	40	118	116		
17	28	42	12	67	28	92	24	119	95		
18	32	43	16	68	16	93	20	120	100		
19	52	44	4	69	12	94	28	121	68		
20	12	45	8	70	12	95	28	122	56		
21	32	46	16	71	40	96	32	123	4		
22	28	47	36	72	52	97	40	124	8		
23	24	48	32	73	40	98	32	127	24		
24	8	49	44	74	60	99	72	128	20		
25	40	50	20	75	56	100	76	129	48		
26	56	51	52	76	40	101	52	130	20		
27	32	52	100	77	44	102	32	131	70		
28	44	53	100	78	42	103	28	132	116		
29	43	54	14	79	38	104	8	133	79		
30	44	55	42	80	60	106	12	134	36		
31	72	56	70	81	32	107	16	135	16		
32	64	57	36	82	20	108	4	136	20		
33	52	58	70	83	24	110	24	137	8		

STAGE 1, WING 6, TF-H1011, SOL GEL, CROSSLINK DENSITY

This sample size summary is applicable to figures 56 and 57.

AD-A069 080 OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1 PHASE E, --ETC(U)
APR 79 J A THOMPSON

UNCLASSIFIED MANCP-416(79) NL

2 OF 2
AD A069 080

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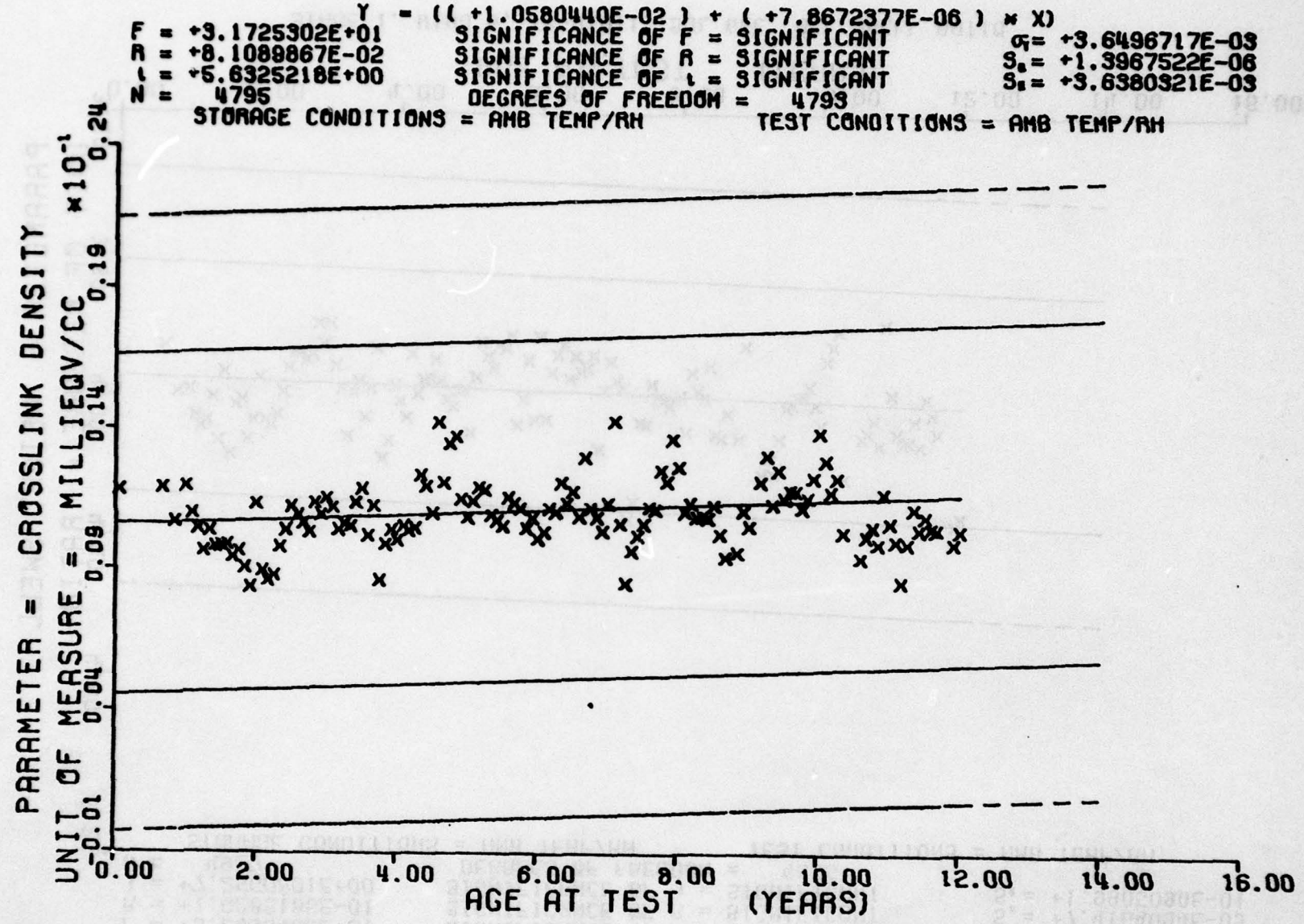
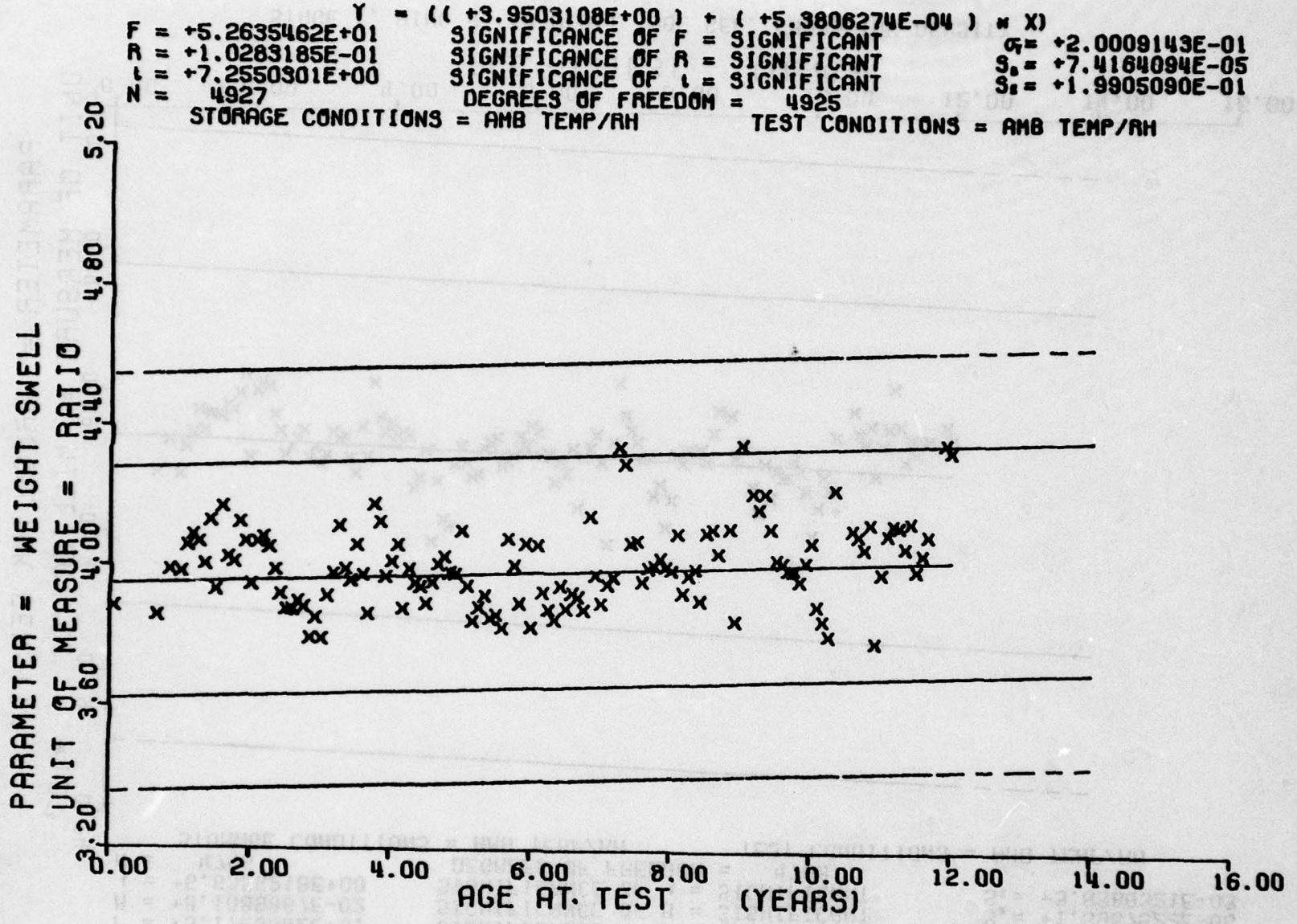
7-79
DDC



STAGE 1, WING 6, TP-H1011, SOL GEL, CROSSLINK DENSITY

Figure 56



STAGE 1, WING 6, TP-H1011, SOL GEL, GEL SWELL RATIO

Figure 57

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
24	19	50	17	75	54	100	36	129	6
25	64	51	60	76	55	101	18	130	54
26	22	52	90	77	43	102	11	131	93
27	29	53	72	78	72	103	6	132	18
28	34	54	42	79	17	104	3	133	13
29	59	55	26	80	46	105	3	134	30
30	31	56	62	81	42	106	3	135	12
31	51	57	69	82	23	107	9	136	12
32	67	58	51	83	29	108	6	137	27
33	56	59	22	84	16	109	33	138	75
34	61	60	20	85	18	110	30	139	60
35	36	61	27	86	24	111	17	140	12
36	26	62	63	87	33	112	22	141	6
37	34	63	58	88	23	113	104	142	18
38	26	64	65	89	43	114	44	143	63
39	33	65	22	90	54	115	51	144	3
40	30	66	10	91	33	116	45	145	6
41	9	67	36	92	26	117	104	146	3
42	21	68	32	93	16	118	31	166	3
43	24	69	35	94	31	119	63		
44	10	70	44	95	33	120	76		
46	25	71	28	96	44	121	42		
47	30	72	21	97	89	122	9		
48	37	73	66	98	67	126	6		
49	64	74	57	99	38	128	9		

STAGE 1 WING 6 TP-H 1011 CONSTANT STRAIN

This sample size summary is applicable to figure 58.

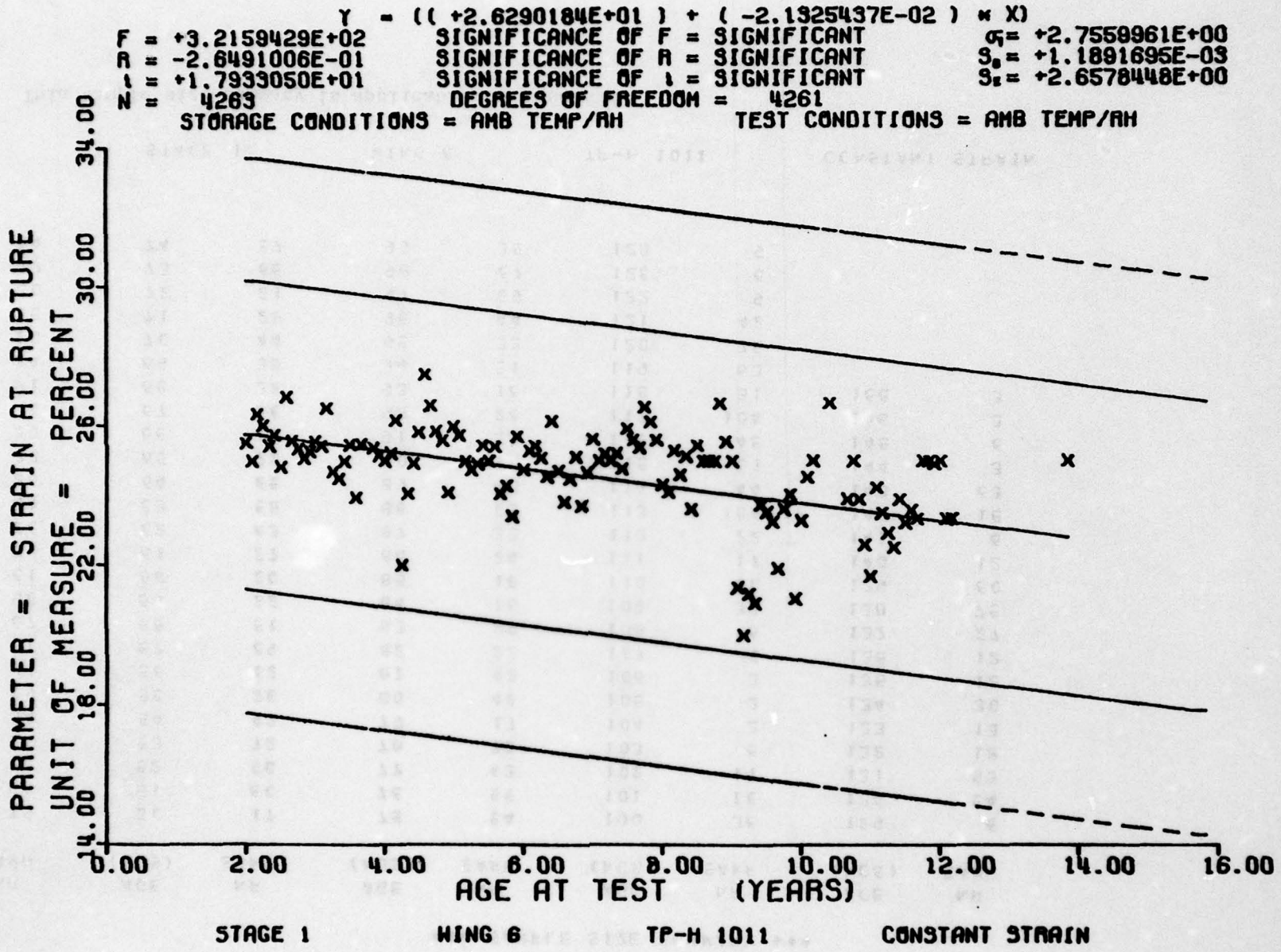

Y = ((+2.6290184E+01) + (-2.1325437E-02) * X)
F = +3.2159429E+02 SIGNIFICANCE OF F = SIGNIFICANT σ1= +2.7559961E+00
R = -2.6491006E-01 SIGNIFICANCE OF R = SIGNIFICANT Se= +1.1891695E-03
t = +1.7933050E+01 SIGNIFICANCE OF t = SIGNIFICANT Sz= +2.6578448E+00
N = 4263 DEGREES OF FREEDOM = 4261
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = PERCENT
34.00
30.00
26.00
22.00
18.00
14.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 CONSTANT STRAIN

Figure 58

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
4	66	29	39	54	54	79	46	104	6	134	18
5	108	30	66	55	73	80	57	106	5	135	18
6	126	31	59	56	60	81	84	107	18	136	30
7	117	32	70	57	63	82	68	110	21	137	18
8	117	33	59	58	69	83	17	111	12	138	52
9	129	34	47	59	73	84	41	112	21	139	45
10	114	35	64	60	65	85	20	113	45	140	21
11	126	36	51	61	60	86	46	114	15	141	15
12	93	37	35	62	66	87	30	115	6	144	18
13	108	38	66	63	102	88	50	116	33		
14	110	39	46	64	64	89	33	117	33		
15	139	40	35	65	56	90	64	118	6		
16	126	41	48	66	63	91	25	119	9		
17	136	42	33	67	48	92	40	120	27		
18	108	43	31	68	67	93	32	123	21		
19	52	44	3	69	113	94	29	124	12		
20	27	45	35	70	137	95	56	125	27		
21	50	46	66	71	46	96	17	126	18		
22	33	47	49	72	78	97	73	127	33		
23	35	48	101	73	45	98	58	128	33		
24	57	49	70	74	100	99	58	129	24		
25	36	50	61	75	73	100	46	130	36		
26	66	51	112	76	60	101	6	131	35		
27	42	52	112	77	72	102	12	132	18		
28	36	53	42	78	72	103	16	133	18		

STAGE 1 WING 6 TF-H 1011 SHORE A, 10 SECOND HARDNESS

This sample size summary is applicable to figure 59.

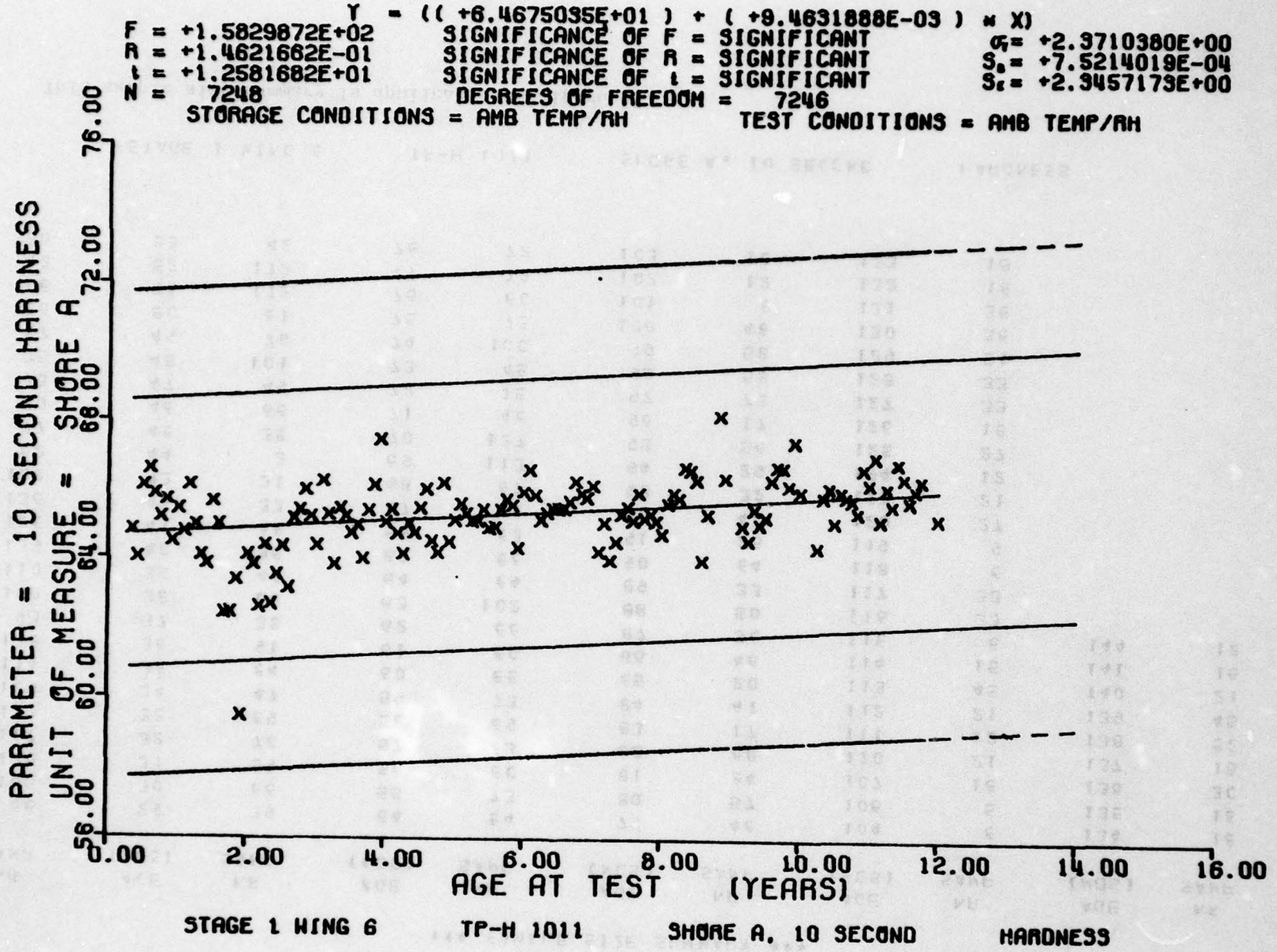

Y = ((+6.4675035E+01) + (+9.4631888E-03) * X)
F = +1.5829872E+02
R = +1.4621682E-01
t = +1.2581682E+01
N = 7248
SIGNIFICANCE OF F = SIGNIFICANT
SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF t = SIGNIFICANT
DEGREES OF FREEDOM = 7246
σ = +2.3710380E+00
Sb = +7.5214019E-04
Sε = +2.3457173E+00
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = 10 SECOND HARDNESS
UNIT OF MEASURE = SHORE A
76.00
72.00
68.00
64.00
60.00
56.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6
TP-H 1011
SHORE A, 10 SECOND
HARDNESS

Figure 59

*** SAMPLE SIZE SUMMARY ***

AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP
8	3	34	39	59	24	84	9	115	56
10	15	35	60	60	13	85	3	116	55
11	1	36	35	61	10	86	3	117	7
12	6	37	10	62	17	87	3	118	10
13	14	38	8	63	20	88	12	120	39
14	13	39	10	64	40	89	24	121	12
15	16	40	11	65	27	90	36	129	3
16	17	41	4	66	18	91	24	130	36
17	18	42	12	67	8	92	9	131	33
18	19	43	4	68	5	93	17	132	5
19	22	44	7	69	4	94	15	133	6
20	35	45	4	70	7	95	19	134	18
21	13	46	9	71	2	96	18	135	25
22	13	47	13	72	6	97	38	136	3
23	19	48	4	73	2	98	40	139	12
24	13	49	30	74	1	99	26	140	12
25	22	50	13	75	30	100	23		
26	27	51	36	76	26	101	21		
27	36	52	35	77	22	102	8		
28	38	53	47	78	13	103	6		
29	43	54	37	79	7	105	9		
30	24	55	25	80	21	106	6		
31	51	56	18	81	24	108	3		
32	42	57	19	82	7	113	3		
33	54	58	16	83	9	114	11		

STAGE 1 WING 6 TP-H 1011 TIME TO MAXIMUM PRESSURE PRESSURE TIME

This sample size summary is applicable to figures 60 and 61.

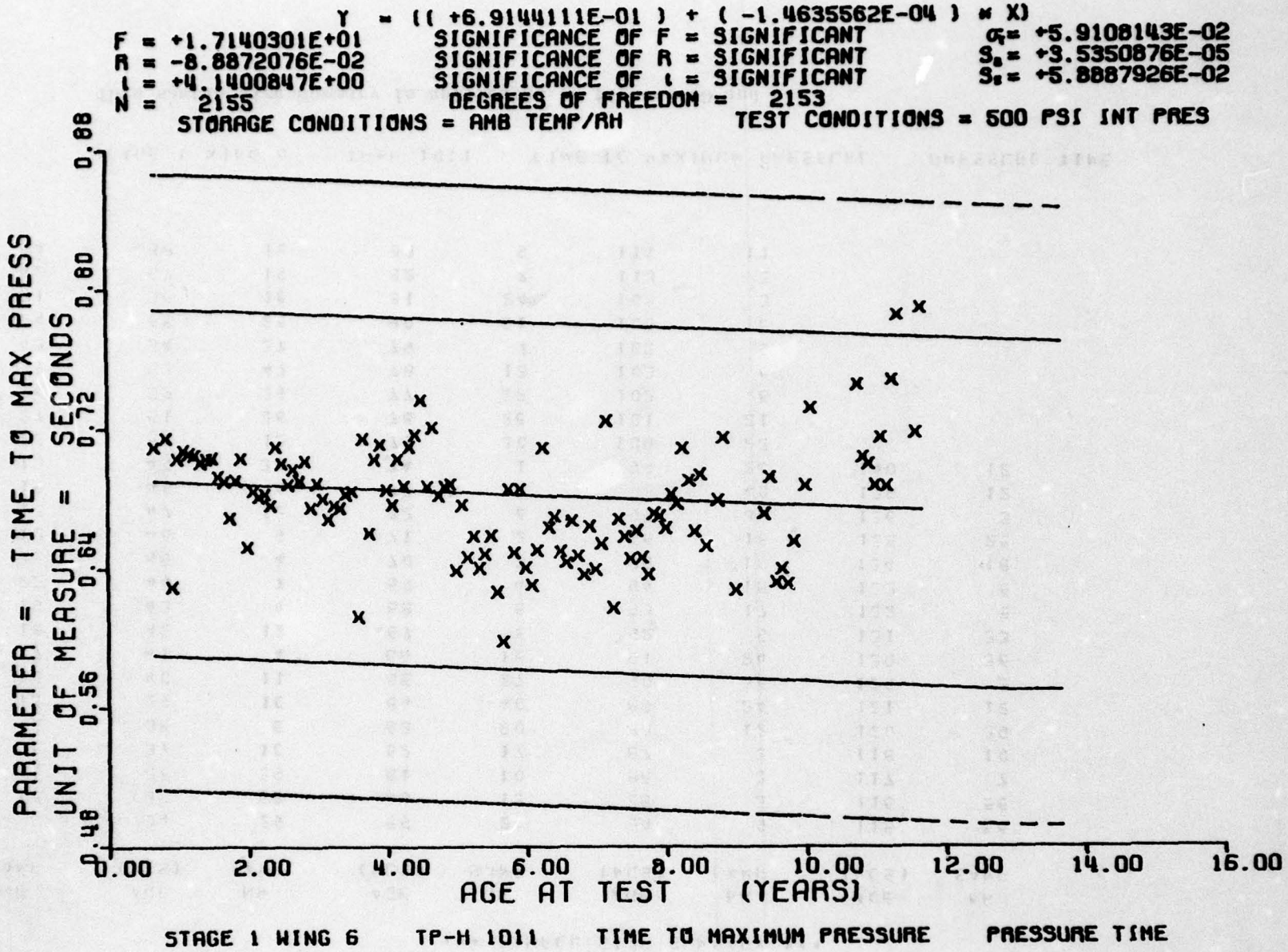

Y = ((+6.9144111E-01) + (-1.4635562E-04) * X)
F = +1.7140301E+01 SIGNIFICANCE OF F = SIGNIFICANT σt= +5.9108143E-02
R = -8.8872076E-02 SIGNIFICANCE OF R = SIGNIFICANT Sb= +3.5350876E-05
t = +4.1400847E+00 SIGNIFICANCE OF t = SIGNIFICANT Sε= +5.8887926E-02
N = 2155 DEGREES OF FREEDOM = 2153
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES
PARAMETER = TIME TO MAX PRESS
UNIT OF MEASURE = SECONDS
0.88
0.80
0.72
0.64
0.56
0.48
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 TIME TO MAXIMUM PRESSURE PRESSURE TIME

Figure 60

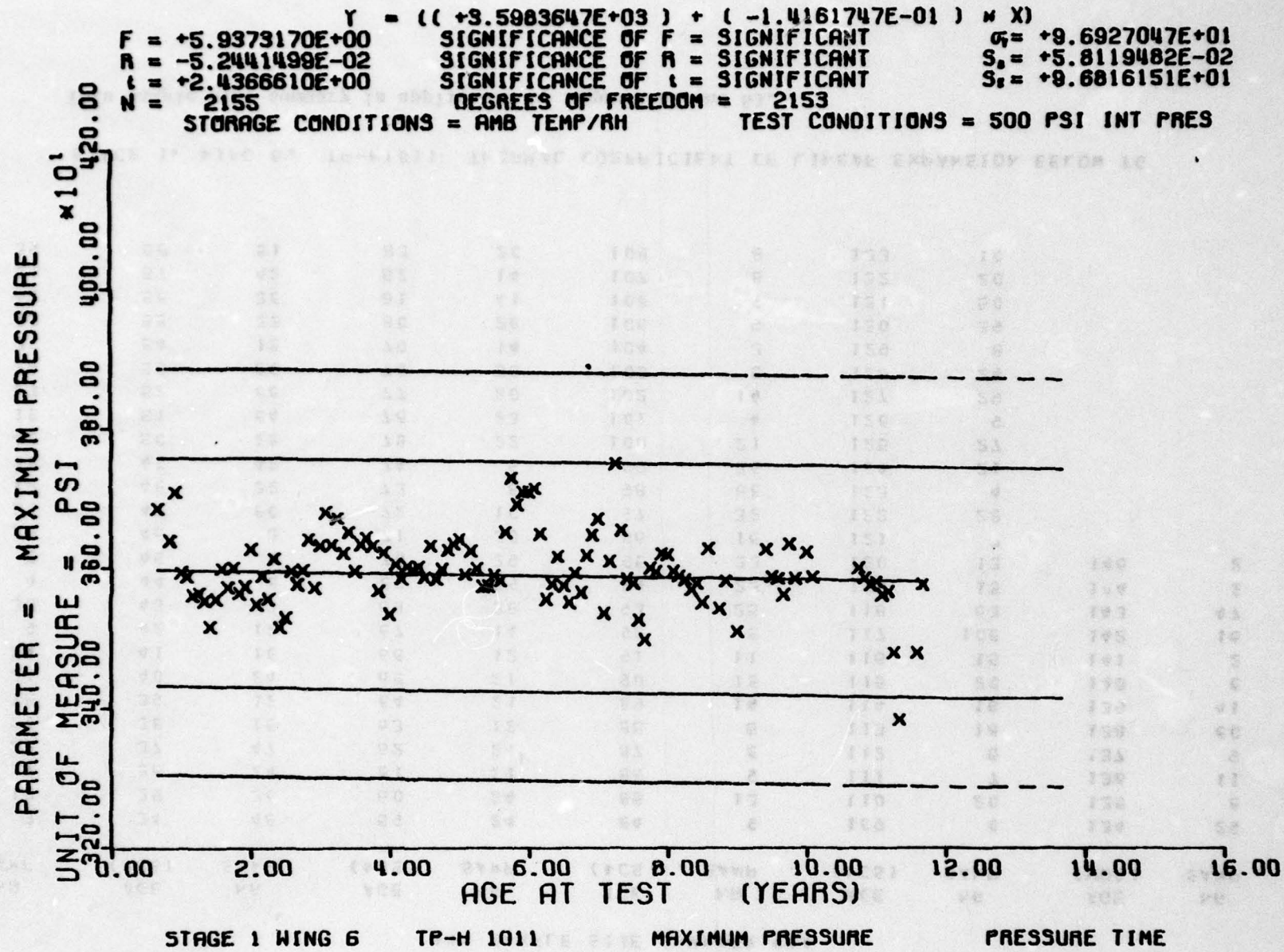

Y = ((+3.5983647E+03) + (-1.4161747E-01) * X)
F = +5.9373170E+00 SIGNIFICANCE OF F = SIGNIFICANT σ = +9.6927047E+01
R = -5.2441498E-02 SIGNIFICANCE OF R = SIGNIFICANT S = +5.8119482E-02
t = +2.4366610E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +9.6816151E+01
N = 2155 DEGREES OF FREEDOM = 2153
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES
PARAMETER = MAXIMUM PRESSURE
UNIT OF MEASURE = PSI x10¹
320.00
340.00
360.00
380.00
400.00
420.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 MAXIMUM PRESSURE PRESSURE TIME

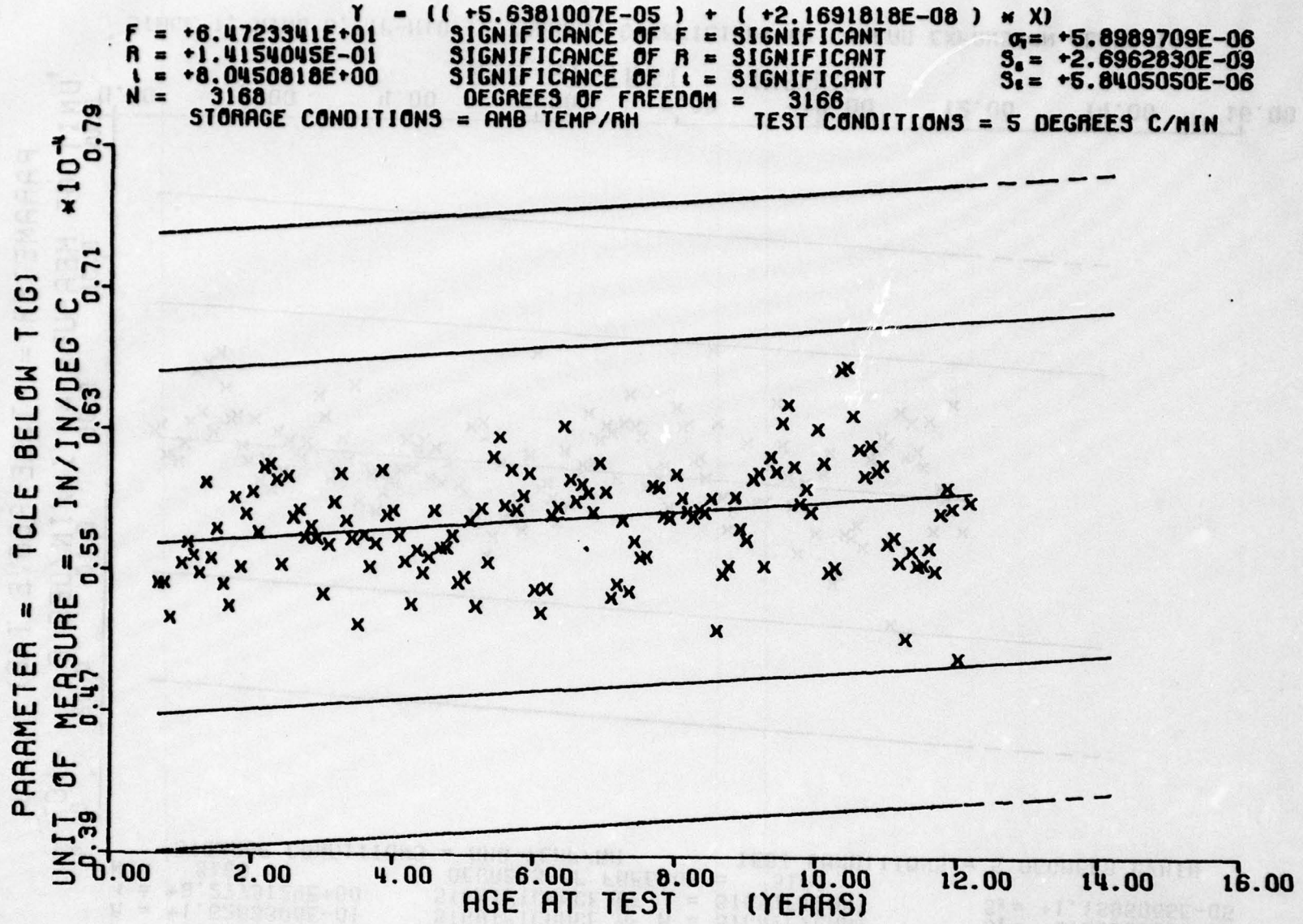
Figure 61

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	34	40	59	24	84	9	109	6	134	29
9	10	35	36	60	24	85	13	110	20	135	8
10	7	36	24	61	21	86	9	111	7	136	11
12	22	37	47	62	21	87	6	112	5	137	9
13	29	38	15	63	12	88	5	113	16	138	60
14	15	39	12	64	21	89	14	114	18	139	41
15	21	40	24	65	21	90	15	115	20	140	6
16	24	41	16	66	12	91	11	116	15	141	2
17	9	42	12	67	14	92	8	117	108	142	16
18	33	43	12	68	26	93	25	118	63	143	47
19	4	44	6	69	59	94	23	119	15	144	2
20	8	45	9	70	39	95	33	120	13	146	2
21	25	46	3	71	20	96	16	121	7		
22	24	47	50	72	10	97	32	122	28		
23	12	48	32	73	8	98	68	123	4		
24	18	49	42	74	5	99	36	124	21		
25	42	50	25	75	22	100	21	125	27		
26	15	51	64	76	23	101	4	126	9		
27	27	52	66	77	20	102	14	127	29		
28	24	53	80	78	35	103	5	128	24		
29	39	54	18	79	14	104	3	129	8		
30	42	55	33	80	26	105	9	130	39		
31	48	56	36	81	41	106	5	131	50		
32	54	57	42	82	14	107	8	132	20		
33	39	58	51	83	20	108	8	133	10		

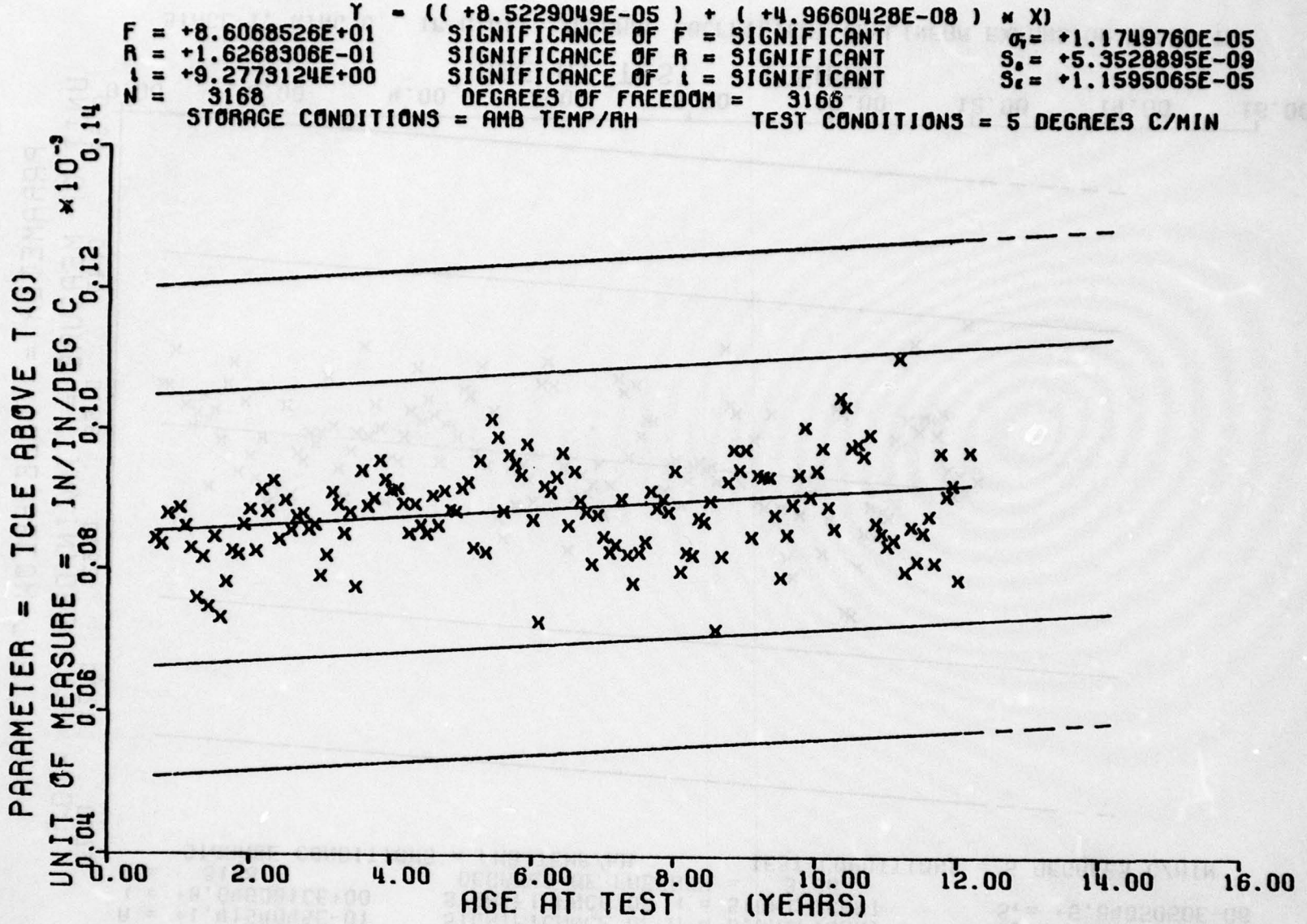
STAGE 1, WING 6, TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

This sample size summary is applicable to figures 62 and 63.



STAGE 1, WING 6, TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

Figure 62



STAGE 1, WING 6, TP-H1011, THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE TG

Figure 63

*** SAMPLE SIZE SUMMARY ***

AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP
1	3	39	3	73	4
11	1	40	3	75	2
13	1	41	3	76	1
15	1	42	3	79	6
16	1	45	3	87	1
18	7	47	1	91	1
19	2	48	2	95	3
20	4	49	1	97	6
21	4	50	3	99	3
22	20	51	3	102	3
23	4	53	3	103	6
24	4	56	1	104	3
25	6	57	3	105	2
26	14	59	1	106	2
27	2	61	1	110	2
28	4	62	1	120	4
29	14	63	2	121	10
30	12	64	3	122	16
31	10	65	2	123	2
32	2	66	1	131	4
33	6	67	4	132	6
34	10	69	4	133	3
35	5	70	1		
36	22	71	2		
37	12	72	1		

STAGE I WING 6 TGA IGNITION TEMPERATURE, 5 DEGREE C RISE/MINUTE

This sample size summary is applicable to figure 64

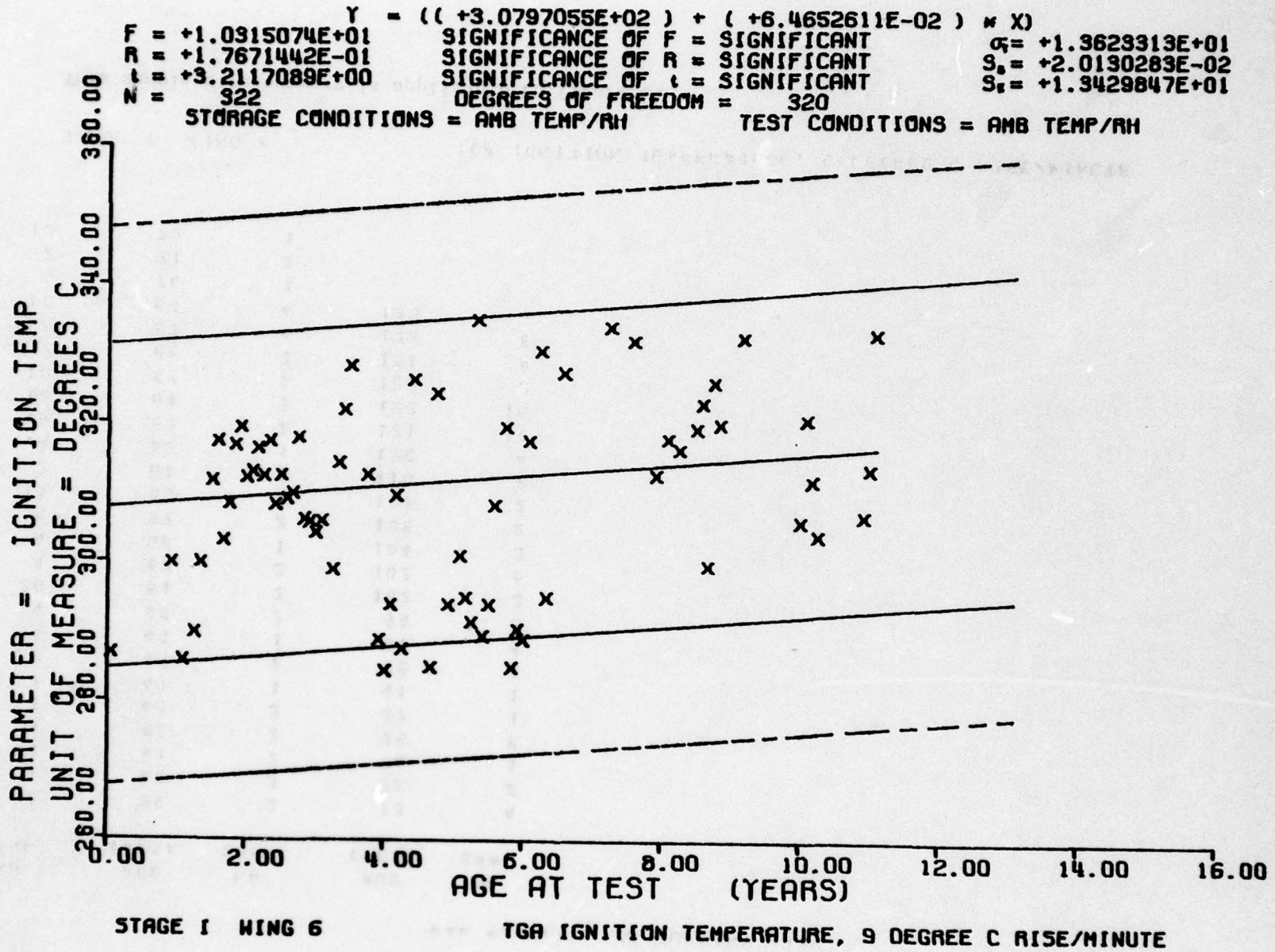

Y = ((+3.0797055E+02) + (+6.4652611E-02) * X)
F = +1.0315074E+01
SIGNIFICANCE OF F = SIGNIFICANT
σt= +1.3623313E+01
R = +1.7671442E-01
SIGNIFICANCE OF R = SIGNIFICANT
Sb= +2.0130283E-02
t = +3.2117089E+00
SIGNIFICANCE OF t = SIGNIFICANT
Se= +1.3429847E+01
N = 322
DEGREES OF FREEDOM = 320
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = IGNITION TEMP
UNIT OF MEASURE = DEGREES C
360.00
340.00
320.00
300.00
280.00
260.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE I WING 6
TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

Figure 64

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
18	3	50	1	132	4
19	1	53	1	133	2
20	1	57	1		
21	2	64	1		
22	10	67	1		
23	2	69	1		
24	2	73	1		
25	3	78	1		
26	7	79	2		
27	1	87	1		
28	2	91	1		
29	7	95	1		
30	6	97	2		
31	5	99	1		
32	1	102	1		
33	3	103	2		
34	4	104	1		
35	2	105	1		
36	6	106	1		
37	1	110	1		
39	1	120	2		
40	1	121	5		
41	1	122	8		
42	1	123	1		
45	1	131	2		

SAGE I WING 6 TGA % WT LOSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

This sample size summary is applicable to figure 65

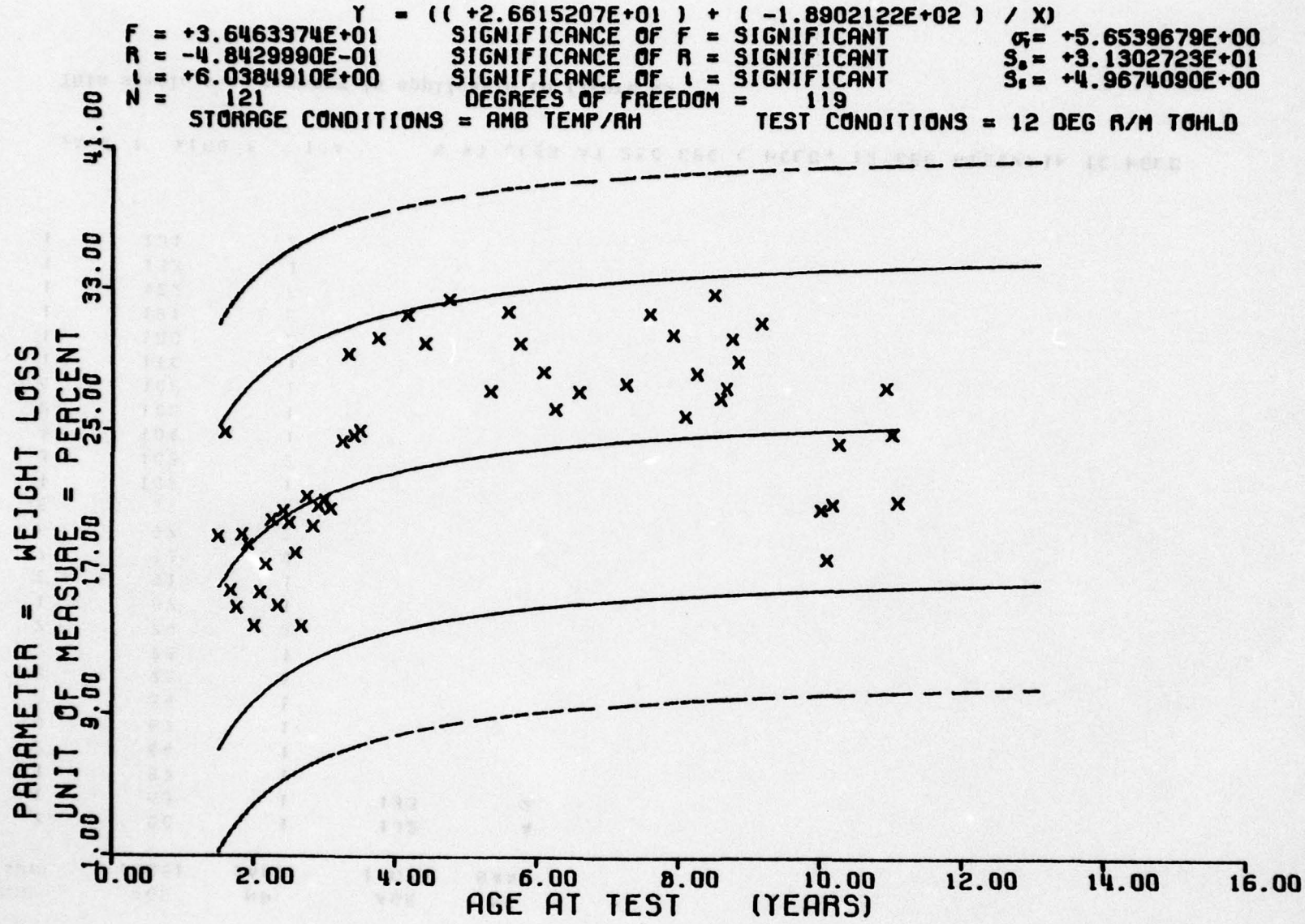

Y = ((+2.6615207E+01) + (-1.8902122E+02) / X)
F = +3.6463374E+01 SIGNIFICANCE OF F = SIGNIFICANT σr = +5.6539679E+00
R = -4.8429890E-01 SIGNIFICANCE OF R = SIGNIFICANT Sa = +3.1302723E+01
t = +6.0384910E+00 SIGNIFICANCE OF t = SIGNIFICANT Sr = +4.9674090E+00
N = 121 DEGREES OF FREEDOM = 119
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG R/M TOHLD
PARAMETER = WEIGHT LOSS
UNIT OF MEASURE = PERCENT
1.00
9.00
17.00
25.00
33.00
41.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
SAGE I WING 6 TGA % WT LOSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

Figure 65

*** SAMPLE SIZE SUMMARY ***

AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP
1	3	39	1	73	4
11	1	40	2	75	2
13	1	41	3	76	1
15	1	42	3	79	6
16	1	45	2	87	1
18	7	47	1	91	1
19	2	48	2	95	3
20	4	49	1	97	5
21	4	50	2	99	2
22	20	51	3	102	3
23	4	53	3	103	5
24	4	56	1	104	1
25	6	57	3	105	2
26	14	59	1	106	2
27	2	61	1	110	2
28	4	62	1	120	4
29	14	63	2	121	10
30	12	64	3	122	16
31	10	65	2	123	2
32	2	66	1	131	4
33	6	67	4	132	8
34	10	69	4	133	3
35	5	70	1		
36	22	71	2		
37	12	72	1		

STAGE I WING 6 TGA PERCENT WEIGHT LOSS AT IGNITION, 9 DEG C RISE/MIN

This sample size summary is applicable to figure 66

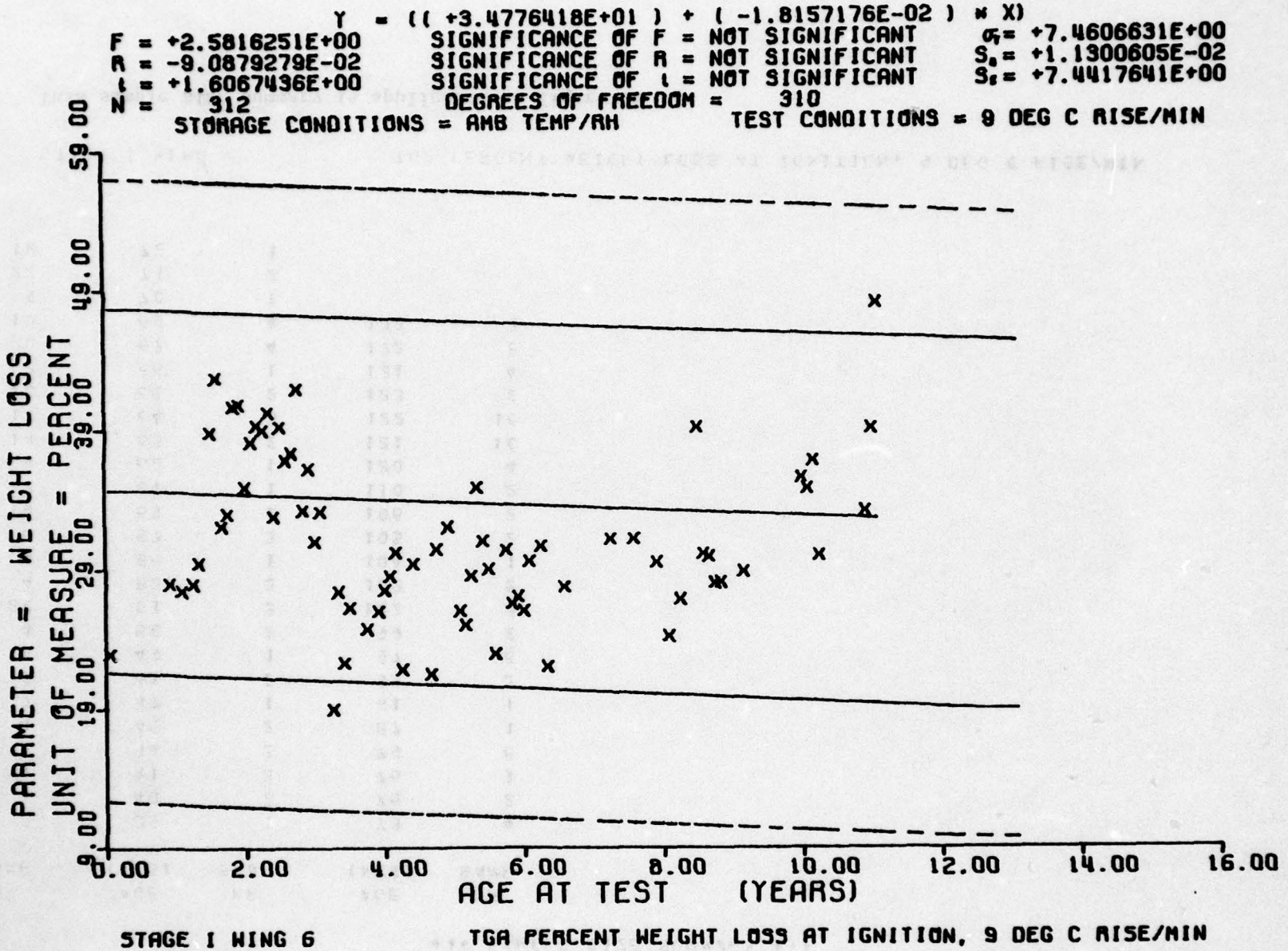

Y = ((+3.4776418E+01) + (-1.8157176E-02) * X)
F = +2.5816251E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_t = +7.4606631E+00
R = -9.0879279E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_e = +1.1300605E-02
t = +1.6067436E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S_r = +7.4417641E+00
N = 312 DEGREES OF FREEDOM = 310
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 9 DEG C RISE/MIN
PARAMETER = WEIGHT LOSS
UNIT OF MEASURE = PERCENT
59.00
49.00
39.00
29.00
19.00
9.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE I WING 6
TGA PERCENT WEIGHT LOSS AT IGNITION, 9 DEG C RISE/MIN

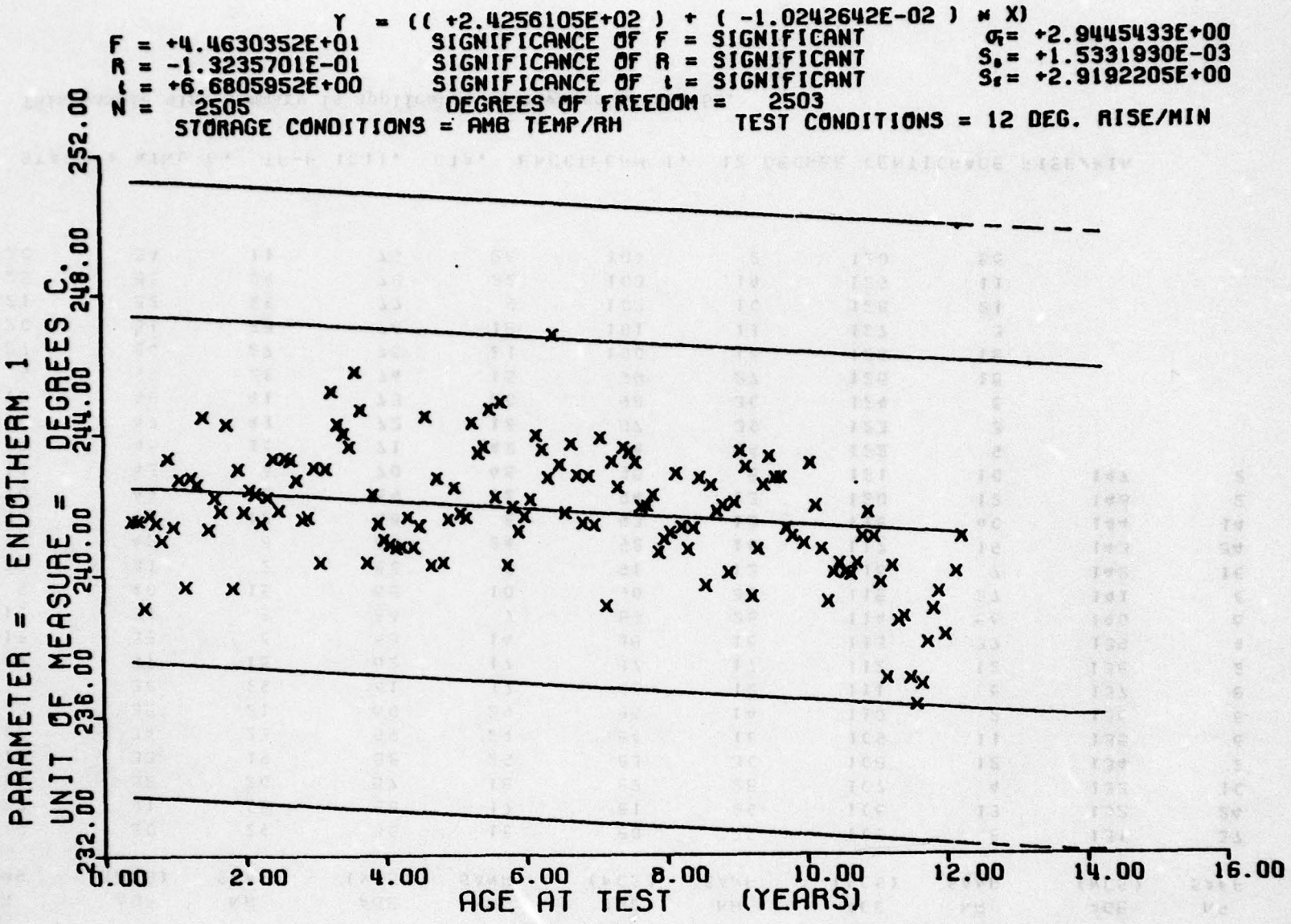
Figure 66

*** SAMPLE SIZE SUMMARY ***

AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP	AGE (MCS)	NR SAMP
5	9	30	29	55	15	80	32	105	8	131	37
6	27	31	26	56	17	81	29	106	13	132	24
7	11	32	20	57	18	82	28	107	4	133	10
8	14	33	19	58	25	83	30	108	12	134	2
9	12	34	33	59	24	84	16	109	11	135	6
10	3	35	21	60	29	85	14	110	2	136	6
11	3	36	25	61	17	86	12	111	6	137	8
12	24	37	18	62	17	87	17	112	12	138	2
13	15	38	6	63	14	88	16	113	37	139	4
14	19	39	5	64	7	89	28	114	56	140	6
15	9	40	15	65	10	90	32	115	27	141	6
16	26	41	2	66	9	91	13	116	7	142	16
17	14	42	8	67	24	92	10	117	19	143	34
18	30	43	12	68	8	93	13	118	40	144	14
19	10	44	3	69	22	94	13	120	12	146	2
20	11	45	6	70	46	95	5	121	10	147	2
21	24	46	15	71	42	96	29	122	9		
22	16	47	41	72	16	97	35	123	3		
23	13	48	41	73	20	98	30	124	6		
24	9	49	36	74	15	99	27	125	15		
25	27	50	27	75	21	100	16	126	15		
26	20	51	23	76	18	101	11	127	3		
27	21	52	25	77	9	102	10	128	21		
28	25	53	34	78	22	103	14	129	11		
29	20	54	11	79	26	104	2	130	56		

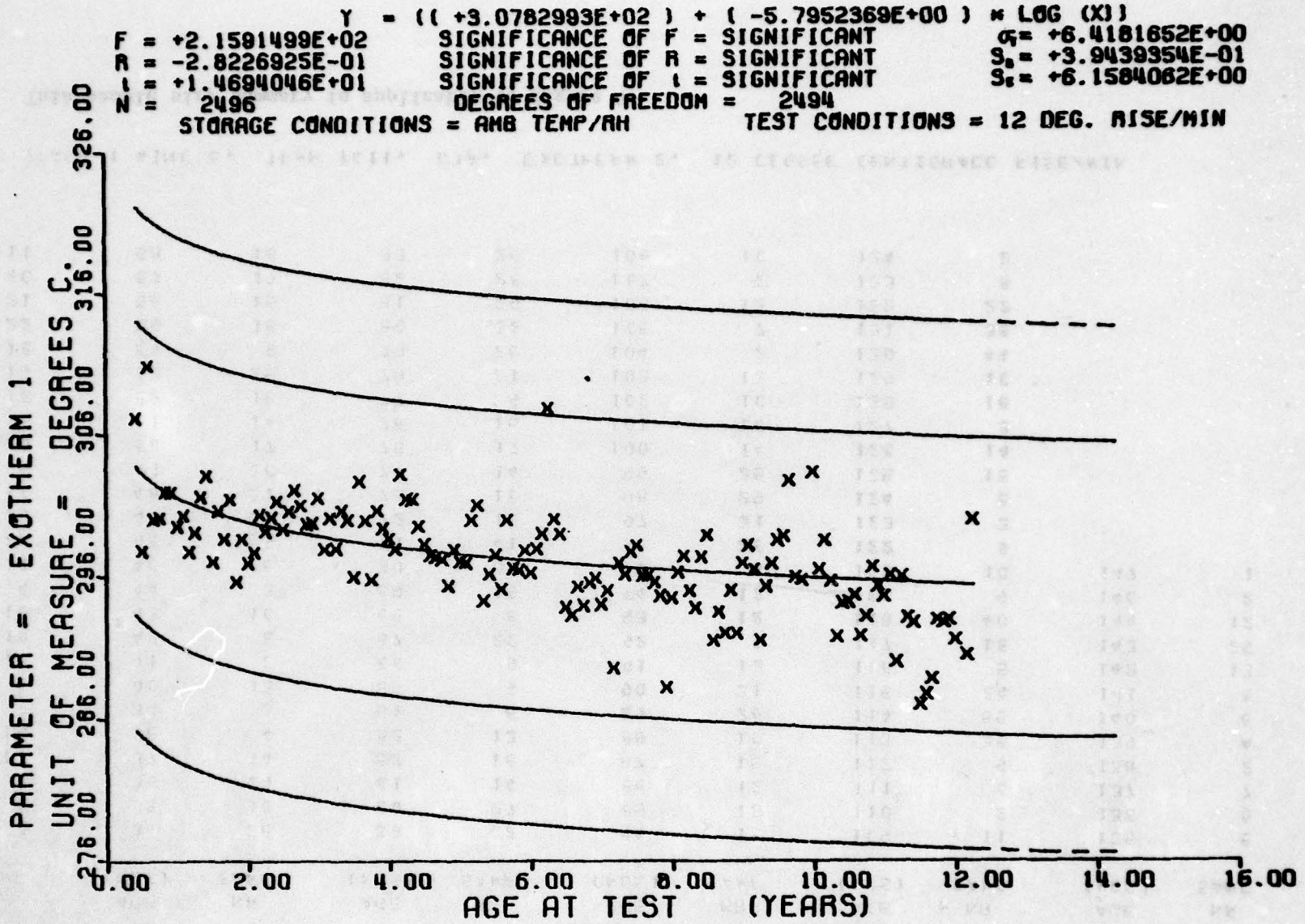
STAGE 1 WING 6, TF-F 1011, CTA, ENDOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figures 67 and 68.



STAGE 1 WING 6, TP-H 1011, DTA, ENDOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

Figure 67



STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

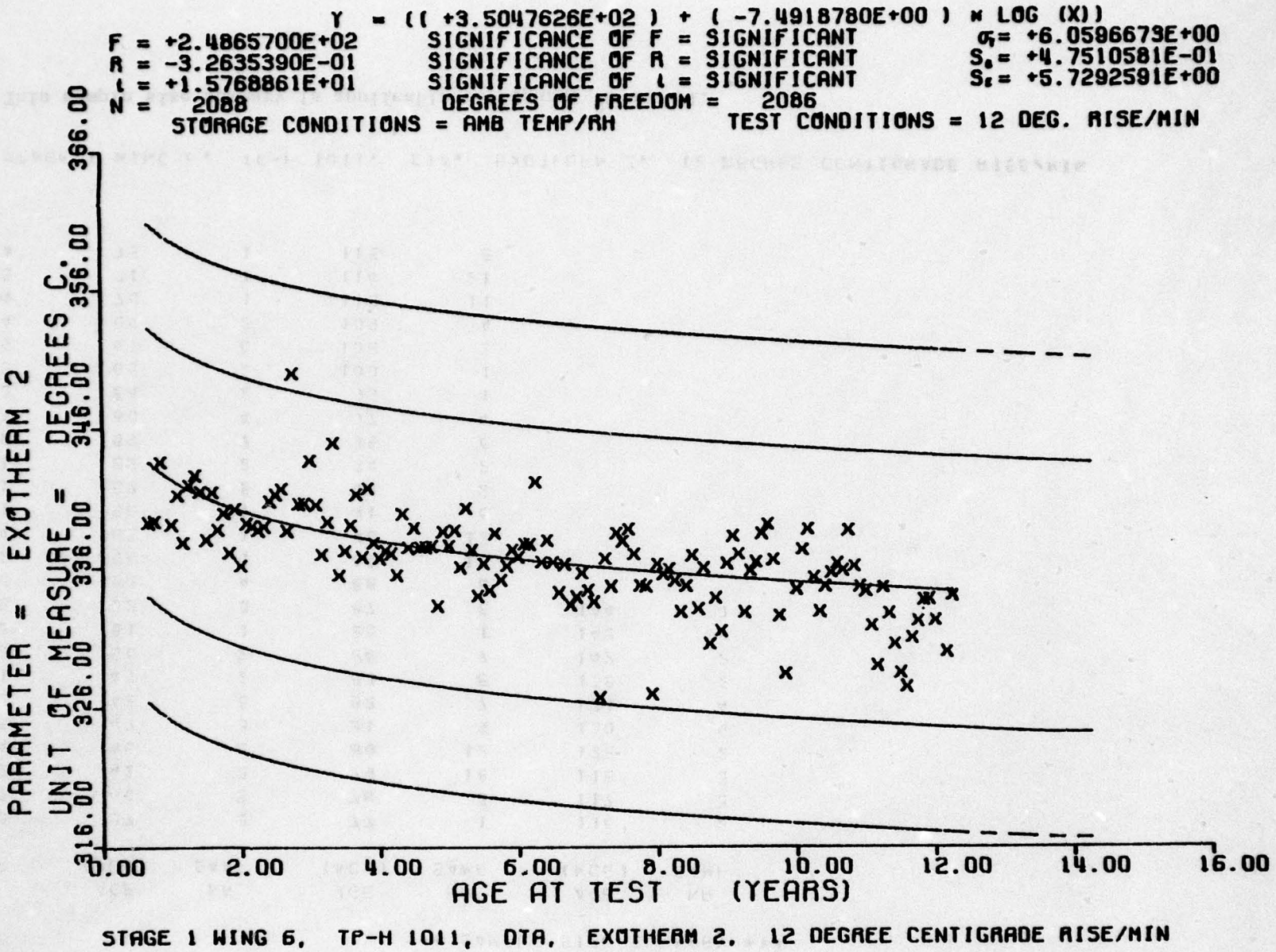
Figure 68

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	34	26	59	22	84	15	109	11	135	5
9	6	35	18	60	27	85	12	110	2	136	8
10	3	36	24	61	14	86	12	111	6	137	7
12	17	37	14	62	16	87	15	112	9	138	2
13	10	38	4	63	13	88	16	113	35	139	4
14	9	39	3	64	6	89	28	114	55	140	6
15	5	40	13	65	9	90	31	115	24	141	5
16	19	41	2	66	9	91	13	116	5	142	13
17	14	42	8	67	22	92	9	117	16	143	29
18	18	43	10	68	8	93	12	118	40	144	12
19	4	44	3	69	19	94	12	120	9	146	2
20	11	45	6	70	39	95	4	121	10	147	1
21	22	46	9	71	41	96	26	122	9		
22	13	47	36	72	15	97	31	123	3		
23	10	48	31	73	16	98	29	124	8		
24	9	49	30	74	14	99	25	125	15		
25	20	50	17	75	17	100	14	126	14		
26	16	51	14	76	16	101	10	127	3		
27	12	52	18	77	9	102	10	128	18		
28	19	53	25	78	21	103	13	129	10		
29	18	54	9	79	26	104	2	130	44		
30	22	55	15	80	32	105	7	131	35		
31	21	56	15	81	29	106	13	132	22		
32	20	57	17	82	28	107	2	133	8		
33	11	58	16	83	26	108	10	134	2		

STAGE 1 WING 6, TF-H 1011, CTA, EXCTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 69.



STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

Figure 69

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
8	3	37	3	77	1	116	2
9	7	40	5	78	3	117	3
11	3	42	3	79	16	118	3
12	4	46	5	80	12	128	2
13	5	47	3	81	9	130	9
14	3	48	6	82	7	131	4
15	1	49	2	83	8	135	2
16	3	50	2	84	7	142	2
17	3	51	1	86	1	143	4
18	5	52	3	87	8	144	1
19	6	53	4	88	8		
21	2	54	1	89	16		
22	4	55	1	90	12		
23	1	56	1	91	6		
24	1	57	5	92	2		
25	1	58	2	94	2		
26	2	59	7	96	6		
27	4	60	4	97	4		
28	3	64	2	99	1		
29	5	65	2	100	1		
30	9	67	6	108	3		
31	4	69	2	109	4		
33	4	70	1	113	11		
34	5	71	1	114	21		
35	4	75	1	115	5		

STAGE 1 WING 6, TF-F 1011, CTA, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figures 70 and 71.

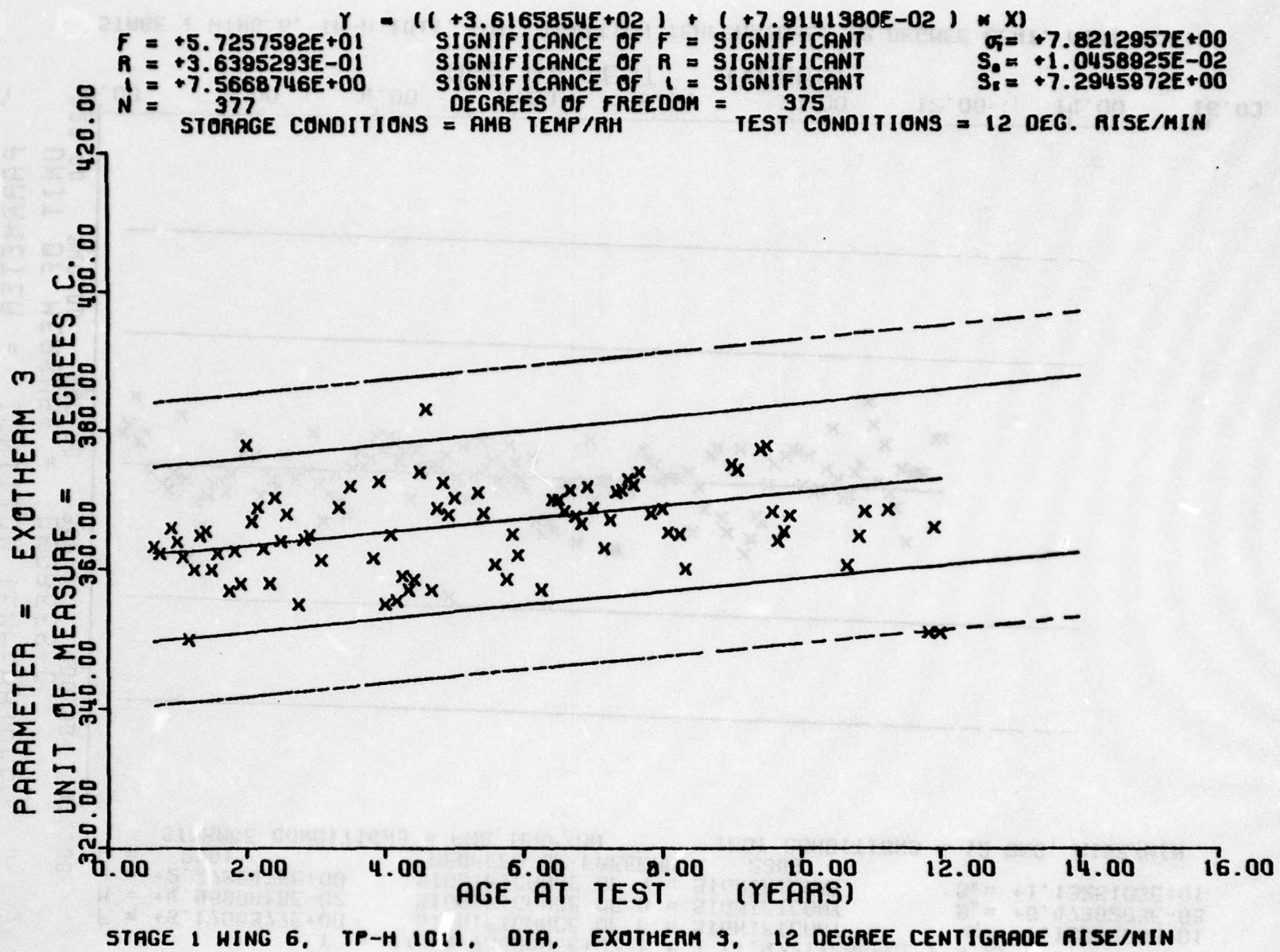
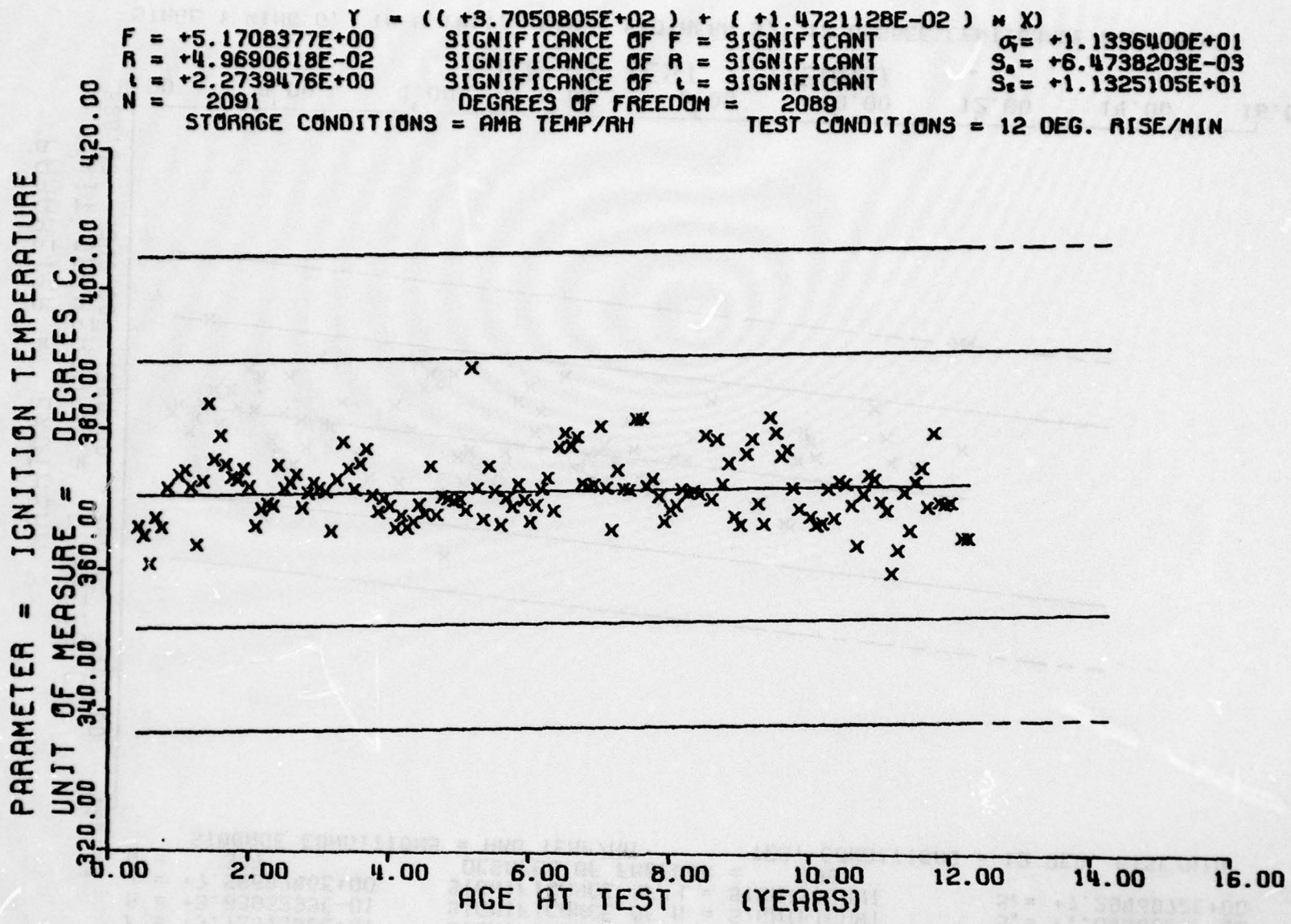

Y = ((+3.6165854E+02) + (+7.9141380E-02) * X)
F = +5.7257592E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +7.8212957E+00
R = +3.6395293E-01 SIGNIFICANCE OF R = SIGNIFICANT S0 = +1.0458825E-02
t = +7.5668746E+00 SIGNIFICANCE OF t = SIGNIFICANT S1 = +7.2945872E+00
N = 377 DEGREES OF FREEDOM = 375
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN
PARAMETER = EXOTHERM 3
UNIT OF MEASURE = DEGREES C.
320.00
340.00
360.00
380.00
400.00
420.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

Figure 70



STAGE 1 WING 6, TP-H 1011, DTA, IGNITION TEMPERATURE, 12 DEGREE CENT. RISE/MIN

Figure 71

*** SAMPLE SIZE SUMMARY ***

AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP	AGE (MOS)	NR SAMP
15	3	41	6	75	57	100	22	129	39
16	9	42	13	76	30	101	6	130	48
17	18	47	3	77	21	102	18	131	83
18	12	52	1	78	8	103	3	132	24
19	12	53	6	79	39	105	3	133	11
20	18	54	26	80	15	107	3	134	15
21	3	55	24	81	28	108	3	135	18
22	3	56	17	82	21	109	3	136	9
24	3	57	24	83	15	110	3	137	9
25	3	58	39	84	9	111	12	138	6
26	8	59	33	85	9	112	14	139	44
27	24	60	38	86	6	113	18	140	21
28	27	61	18	87	3	114	51	141	24
29	46	62	40	88	12	115	47	142	9
30	18	63	36	89	10	116	22	143	6
31	42	64	20	90	22	117	21	144	30
32	31	65	10	91	11	118	23	145	27
33	43	66	3	92	23	119	27	146	33
34	29	67	3	93	6	120	77	147	3
35	43	69	6	94	6	121	24	149	3
36	43	70	3	95	14	122	18	151	3
37	23	71	4	96	18	123	9	152	3
38	14	72	24	97	24	126	6		
39	15	73	29	98	32	127	22		
40	12	74	47	99	33	128	9		

STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

This sample size summary is applicable to figure 72.

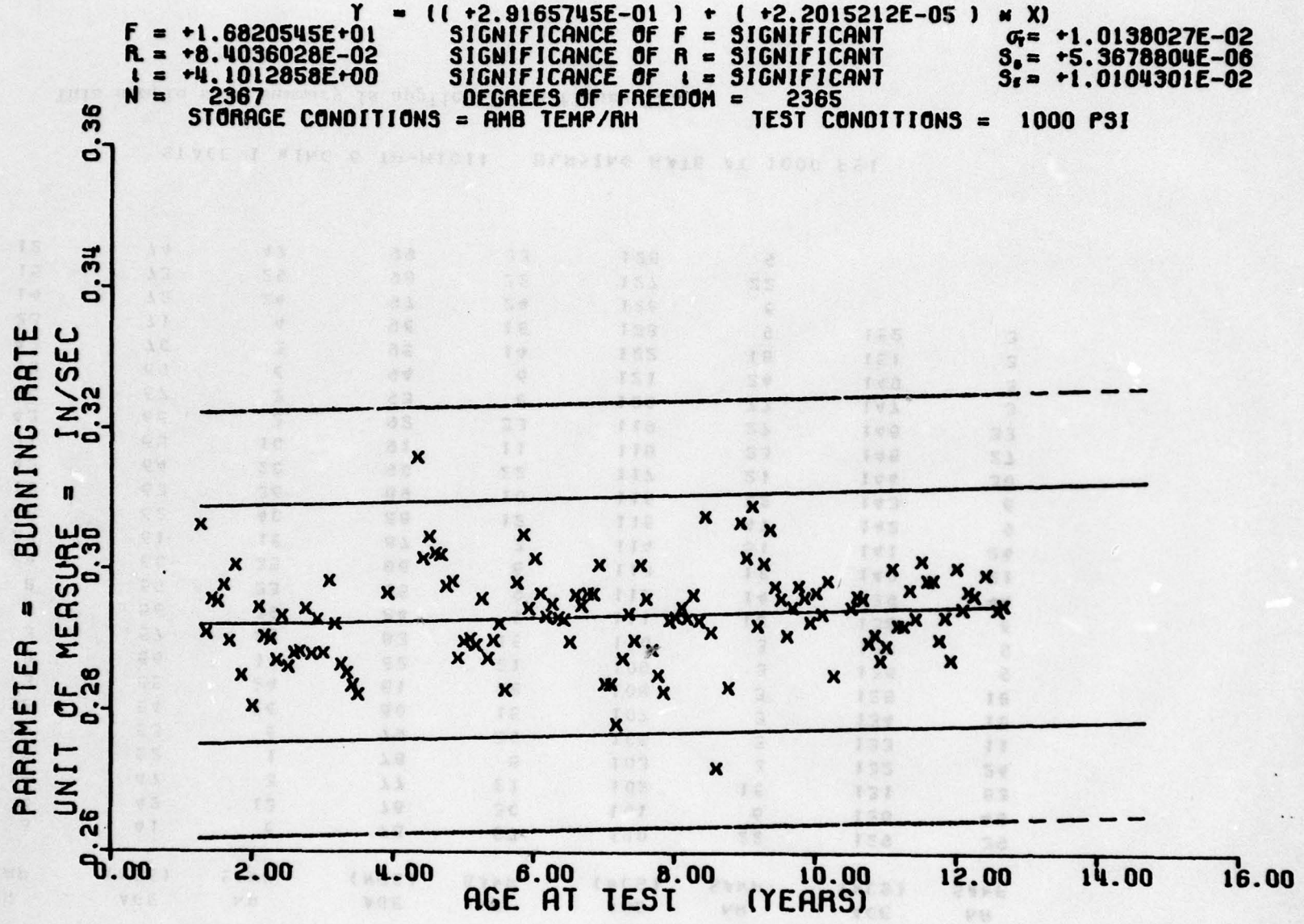

Y = ((+2.9165745E-01) + (+2.2015212E-05) * X)
F = +1.6820545E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.0138027E-02
R = +8.4036028E-02 SIGNIFICANCE OF R = SIGNIFICANT S = +5.3678804E-06
t = +4.1012858E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +1.0104301E-02
N = 2367 DEGREES OF FREEDOM = 2365
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 1000 PSI
PARAMETER = BURNING RATE
UNIT OF MEASURE = IN/SEC
0.36
0.34
0.32
0.30
0.28
0.26
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE I WING 6 TF-H1011 BURNING RATE AT 1000 PSI

Figure 72

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: 416(79)	2. GOVT ACCESSION NO.
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4. TITLE (and Subtitle): Propellant Surveillance Report LGM-30 F & G Stage 1, Phase E Series VII, TP-H1011	5. TYPE OF REPORT & PERIOD COVERED: Test Results-Semi-annual
6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s): John A. Thompson	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Propellant Lab Section, Directorate of Maintenance, OO/ALC Hill AFB, Utah 84056	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: MMEMP Project M82934C-WNL 17514
11. CONTROLLING OFFICE NAME AND ADDRESS: Service Engineering Division, Directorate of Materiel Management, OO/ALC Hill AFB, Utah 84056	12. REPORT DATE: April 1979
	13. NUMBER OF PAGES: 126
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Solid Propellant
Minuteman

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M82934CWNL17514.

The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (thirteen

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years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.